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National Field Research Center, Inc, Iowa City, Iowa

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A National Environmental/Energy Workforce Assessment

NATIONAL SUMMARY

Volume Two

Iowa—Nebraska

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16. ABSTRACT

This study is one of 70 volumes assessing the workforce needs (manpower needs) for pollution control and abatement in the United States for the five-year period of 1976 through 1981. Seven fields for pollution control — air, noise, pesticides, potable water, radiation, solid waste, and wastewater — are analyzed, together with energy-related programs currently accentuated by the national effort to solve energy supply problems.

Designed as Phase I of a three-phase program, the complete assessment includes the following volumes: one each for the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands; one for each of the ten EPA regions; a one-volume National Abstract; a volume on National Legislation; a volume on Business and Industry; and a four-volume National Summary. The information was gathered through extensive personal interviews with responsible federal, state, and local officials in every state; with officials of representative private industrial and commercial firms; and with representatives of national industrial and trade organizations.

Phase II will develop a broad national inventory of the entire range of post-secondary and higher education training offered in the pollution control and energy areas cited above, and Phase III will offer demonstrations for curriculum changes or modifications which appear necessary to assure an adequate and properly trained national environmental/energy workforce.

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The names of the federal, state and local agencies, groups and individuals who made this study possible through their patience and cooperation would be too numerous to mention. However, it must be pointed out that the information in these summaries and the other volumes of this study is a direct consequence of their participation. The research staff served largely as reporters and documenters of the facts and opinions they provided. In some instances, the authors supplied editorial commentary, but it was with the knowledge and understanding of the particular data source. Essentially, the study is theirs, from the landfill operator or the pesticide applicator to the state, regional or the federal administrator. Its relative degree of success will be a direct corollary of the credibility decision makers attach to the information furnished by those professionals working in the fields considered by this study.

National Field Research Center
Iowa City, Iowa
Dr. Richard L. Benesh, Jr.
Project Director

PREFACE

In reviewing these summaries, it should be pointed out that differences in the consistency of information is a reflection of several factors. To begin, for a number of states, figures were either not available at the time the field research was carried out or respondents were reluctant to provide estimates because of the tenuous nature of state and local program output reporting. In a majority of instances, these circumstances were a consequence of budgetary constraints imposed by state legislatures. Thus, state and local environmental control officials have been confronted with a situation where they must depend, in large measure, on federal funding programs to maintain minimal operational status, which is not always in compliance with federal mandates. Still, some states have been especially active in mounting environmental programs consonant with federal standards and uniquely suited to their particular problems. In these cases information is relatively complete and documented to be accurate.

Moreover, the presence or absence of workforce information may be said to be a measure of the individual state approach to the importance of environmental pollution control and abatement programs; the degree of support provided by state and local government; the support for program operation and maintenance provided by the federal government; and, the immediacy of environmental pollution problems in a given state or area.

Finally, though less quantifiable, but frequently voiced, program officials in several states were less than enthusiastic about participating in the assessment because they felt that little if any positive, substantive action would come of the effort. With this in mind, it is understandable that there would be occasional reluctance to "go the extra mile" in providing professional judgments regarding specific workforce figures or projections. Still, in the great majority of instances, program officials did go the extra mile as evidenced by their frequently unsolicited post-research interest in reviewing assessment outcomes.

All of the foregoing are indicators of what might be termed an inconsistency in the level of reporting. However, it is more nearly correct to assert, given the experience of the project, that these informational disparities as well as the converse informational completeness of many states are a reasonable and accurate representation of the state of the art across the nation. This can be exemplified by singling out states, for instance, which on one hand have no mandatory certification for water treatment plant operators or no legislation governing the amounts of pollutants emitted into the air, and comparing them with those which have comprehensive legislation and commensurate funding to support that legislation. These summaries, then, while they may present reasonable estimates of the national environmental/energy workforce situation, may do more to represent the problems of individual states with respect to meeting national standards, e.g., some cannot, some will not and some may not have a need or a desire for federal assistance.

In sum, these state briefs may be distilled down to a postulate which suggests too little consistent articulation of federal policy and too little continued support for maintenance of programs which are either stop-gap in their efforts to contain pollution or have questionable long-range cost or human benefit.

FOREWORD

This report contains the state summaries of the National Environmental/Energy Workforce Assessment conducted for the United States Environmental Protection Agency by the National Field Research Center of Iowa City, Iowa. Each individual state program summary is followed by a depiction of the current and projected (1976-1981) workforce figures for the following areas:

AIR
NOISE
PESTICIDES
POTABLE WATER
RADIATION
SOLID WASTE
WASTE WATER
ENERGY

An overview of selected environmental/energy education programs has also been included. These programs do not necessarily represent the entire spectrum of available opportunities, but rather a sample of those significant, well-defined offerings which address the workforce needs of the disciplines outlined above.

More detailed information regarding the workforce assessment is to be found in the respective State or Regional volume of the study.

National Environmental Energy Workforce Assessment

Phase I

IOWA

State Summary

I. AIR

The Iowa air pollution control program is the responsibility of the Air Quality Management Division within the Department of Environmental Quality (DEQ). In addition the Air Quality Commission has policy-making and rule-making authority. The State Hygienic Laboratory (SHL) provides assistance in air monitoring activities, and local air quality programs are conducted in Cedar Rapids and Des Moines.

A staff of 20 persons is employed by DEQ's Air Quality Management Division in both the Permits Section and the Surveillance and Compliance Section. In addition to Division personnel, SHL has five people involved in air pollution control, the Des Moines program employs six persons, and the Cedar Rapids program has an equivalent of 4.8 full-time employees. Engineers, physicists, chemists, and technicians are the most prominent professional categories.

Substantial workforce growth has occurred since 1973; as a result it is felt that a stable program exists and very little additional growth is expected. Division expansion will occur only in possible new program areas. Local programs cited budget limitations as restricting the hiring of at least one additional person. Positions to be filled will most likely be in the occupations noted above, with openings coming as a result of a 16 percent per annum turnover and 4 percent per annum growth.

II. NOISE

Iowa does not have a comprehensive noise control law and there is not currently a statewide noise program. The Department of Transportation's (DOT) Highway Division does attempt to control vehicular noise through design and construction techniques. Additionally nine cities in Iowa have enacted municipal noise control ordinances.

The Department of Environmental Quality would be the state lead agency in any noise control program, but no members of the staff are involved in noise matters at the present time. Four persons within DOT are active in noise studies and impact assessments. No information is available concerning the number of persons involved in local noise matters; generally local law enforcement personnel assume this responsibility.

No workforce growth or career potential is anticipated for Iowa noise programs. Greater concern with the environmental effects of noise and possible passage of a noise control law could alter these projections.

III. PESTICIDES

The status of Iowa as a leading agricultural state has caused a great deal of emphasis to be placed on pesticide use and control. Workforce needs have been altered dramatically by the Federal Environmental Pesticide Control Act.

Pesticide program responsibility rests jointly with the Iowa Department of Agriculture (DOA) and the Department of Environmental Quality (DEQ). The Laboratory Division of DOA and the Chemical Technology Commission and Land Quality Management Division of DEQ cooperate on pesticide matters. The Iowa State University Cooperative Extension Service has been active in applicator training.

A staff of 18 persons in DOA has been assisted by 20 agricultural product inspectors in pesticide testing, registration and control. Two persons within DEQ have been active in applicator certification and pesticide matters. It is estimated that 7,000 commercial applicators and 77,500 private applicators will be certified by the end of 1977.

Workforce projections indicate an increase of from four to eight pesticide investigators within DOA to meet state and federal law mandates. Growth over the next five years is expected in the private and commercial applicator categories, possibly reaching a total of 100,000. No determination of growth within DEQ could be made. Employment prospects for persons with agricultural training appear to be good in both the state and federal public sectors.

IV. POTABLE WATER

Primary responsibility for Iowa's potable water supply rests with the Water Quality Management Division of the Department of Environmental Quality (DEQ). The Health Engineering Division of the Department of Health has a very limited role in water supply matters.

DEQ's Water Quality Management Division has state responsibility for wastewater and water supplies. The Division has a staff of 58 persons whose functions are not always clearly separable into wastewater and water supply areas. A summary of DEQ staff involvement is contained under the Wastewater Section.

The Department of Health is primarily concerned with sampling and evaluations of private water supplies. Because the definition of public water supplies has been broadened by the Safe Drinking Water Act, the number of private water supplies has been decreased. It appears likely, however, that Department of Health will work with DEQ to continue its monitoring effort of many of these sources.

Presently a staff of 10 professionals work in the Health Engineering Division of the Department of Health. The job title of these persons is area sanitarian and only a small percentage of each one's time is devoted to private water supply work. As the Division assists DEQ in monitoring some small public supplies, guidelines developed by DEQ will need to be followed.

V. RADIATION

Iowa has had a very limited radiation protection program and, in fact, is the only state without controls on X-ray machines. The Solid Waste Disposal Commission and the Land Quality Management Division within DEQ have lead agency responsibility for radioactive material control. In 1976 the Interagency Coordinating Council on Radiation Safety was created to coordinate state radiation matters.

In the current fiscal year only one person at DEQ is engaged part-time in radiation control activity. The employee's major function involves a survey of possible unsafe disposal of radioactive waste in the state.

Because of Iowa's limited radiation program, career opportunities are likely to be minimal. The enactment of an X-ray use control law could result in the need for some technicians to carry out mandates of the law. Iowa has only one nuclear power facility at the present time, but if more are constructed the workforce potential in this area could also improve.

VI. SOLID WASTE

Solid waste management and control is an area of growing concern in Iowa. An effort to control land pollution and to increase recycling and recovery are largely responsible for the concern.

The Solid Waste Disposal Commission and the Land Quality Management Division have primary responsibility for developing and carrying out programs in this area. The Division has a staff of 12 full-time persons in its Surveillance and Compliance Section and the Permits Section. Chemists, civil engineers and environmental specialists are the most commonly represented professions.

Workforce needs within the Division have not been determined for various job categories. Growth throughout DEQ will lead to an eight percent per annum expansion in all areas. In the solid waste area, new personnel are most likely to be needed to carry out state responsibilities under the Resource Conservation and Recovery Act and the Toxic Substances Control Act. If significant growth does occur, most opportunities will be for planners, engineers, and persons skilled in resource recovery and recycling operations.

VII. WASTEWATER

Control of water quality in Iowa is crucial both for a variety of uses and the protection of aquatic life. Agricultural waste and non-point sources are the major water pollution problems. Within DEQ the Water Quality Commission and the Water Quality Management Division are responsible for water pollution control and water supply programs throughout the state. The State Hygienic Laboratory (SHL) and the Health Engineering Division of the Department of Health also have a role in these programs.

The Water Quality Management Division is divided into four Sections: Grants and Program Management, Planning, Permits, and Surveillance and Compliance. A staff of 58 persons makes this Division the largest in DEQ. Civil engineers, sanitary engineers and environmental specialists represent the bulk of the full-time personnel. Eight technicians, biologists and chemists from SHL are involved in water quality control.

Workforce in the water pollution and potable water fields has expanded noticeably in the past three years as a result of the 1972 Amendments to the Federal Water Pollution Control Act and the Safe Drinking Water Act of 1974. Because hiring adjustments for most of this legislation have been made, only an eight percent per annum growth rate is expected. Engineers, environmental specialists, and Section 208 planners are the occupations likely to be in greatest demand.

VIII. ENERGY

Iowa has few energy resources and, as a result, its major effort in this area concerns conservation, allocation and policy development. The Energy Policy Council was created in 1974 to coordinate energy matters in Iowa and to unify the state's approach and response to future energy problems.

The Energy Policy Council is a thirteen member policymaking unit and has a staff of seven full-time employees. Conservation, education and research represent the primary thrusts of current Council activity. No information is available on the workforce in private energy fields or utility operations.

Little workforce growth is anticipated because of budget limitations; the current unsettled state of the energy field also makes long range planning very difficult. Career potential in the public sector energy field is expected to be minimal unless fuel allocation regulations are re-imposed. The shortage of energy supplies and the need to conserve energy are expected to be the focus of Council activity over the next five years.

STATE OF IOWA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	20	20	20	22	22	24	4%
NOISE[2]	4	4	4	4	4	4	0%
PESTICIDES[3]	18	19	21	23	24	24	6%
POTABLE WATER[4]	10	10	10	10	10	10	0%
RADIATION	0	0	0	0	0	0	0%
SOLID WASTE	12	13	14	16	17	18	8%
WASTEWATER[5]	58	62	67	72	78	85	8%
ENERGY[6]	7	7	7	7	7	7	0%
TOTALS	129	135	143	154	162	172	6%

[1] Does not include local air program or SHL personnel.

[2] Does not include local law enforcement personnel.

[3] Does not include commercial and private applicators totaling approximately 84,500.

[4] Includes only Department of Health personnel involved in potable water matters on a limited basis.

[5] Does not include SHL personnel nor 4,361 certified operators; this total does include agency personnel in both wastewater and potable water programs.

[6] Energy Policy Council staff limited by statute to 7.5 permanent employees.

EDUCATION

Interest in environmental education programs has grown dramatically in Iowa in recent years. The number and variety of course offerings in institutions of higher education reflects a concern for abating pollution sources and protecting valuable natural resources.

Luther College, Cornell College, Coe College and Briar Cliff College are some of the four-year institutions offering programs in environmental studies, environmental biology and conservation, and environmental sciences. The University of Northern Iowa also has an environmental studies program. Iowa State University has curricula in environmental studies, water resources, and sanitary engineering.

Environmental education offerings at Iowa's two-year institutions are more limited. Iowa Central Community College offers a degree in environmental control technology. New programs at Kirkwood Community College include environmental health technology and water and wastewater technology. It is likely that more programs will be offered in the near future.

LEGISLATION

The environmental/energy legislation for Iowa was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Quality Act

Pesticide Act of Iowa

Energy Policy Council Law

Surface Mining Law

National Environmental Energy Workforce Assessment

Phase I

KANSAS

State Summary

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I. AIR

The Bureau of Air Quality and Occupational Health of the Kansas State Department of Health and Environment is the administrative office of all state air pollution control and abatement activities. The Bureau of Air Quality is currently staffed with 30 positions: 25 professional and 5 clerical positions. Of the thirty, 26 staff members are directly involved with air pollution control, and the remaining four are responsible for the Occupational Health Program. Of these 26 positions, 22 are professional and 4 are clerical. The professional positions include engineers, administrators, and non-degreed electronic and air pollution control technicians. The Bureau anticipates a 5% per annum growth in staffing during the next five years.

There are three local air pollution control agencies. These agencies are currently staffed with fifteen positions: 12 professional and 3 clerical. The professional category consists of five engineers and seven technicians. No growth is anticipated in the local agencies, and a decrease of two positions at the Kansas City agency is planned due to fiscal constraints.

Estimates indicate that in excess of 3,500 persons are involved in varied air pollution control activities in the state with approximately 1,000 engineers and 2,500 technicians. Rough estimates indicate that the private sector will grow by 5% per annum during the next five years.

II. NOISE

The Kansas State Department of Health and Environment and the Kansas State Department of Transportation are the two primary state agencies which operate environmental noise programs. Within the Department of Health and Environment, the Bureau of Air Quality and Occupational Health has been delegated community noise responsibility. The Bureau currently employs two persons whose activities focus upon OSHA related noise monitoring. Under this program, the Bureau has been providing technical assistance to municipalities in reviewing city codes, community surveys, and ordinance development. If the proposed noise legislation being submitted to the Legislature in 1977 is adopted, a community noise program will be developed and staffed with two engineers.

The Department of Transportation is currently staffed with six full-time environmental specialists: one engineer and five engineering technicians. No growth is predicted for the Department during the next five years. The Department administers a traffic noise control program.

Municipalities and private industries in Kansas have relatively underdeveloped industrial/environmental noise control and abatement programs. Limited information is available on the private sector workforce. Any growth in the private sector will be directly related to expanded state and municipal enforcement activities. However, private sector workforce requirements are predicted to remain constant.

III. PESTICIDES

The Kansas Board of Agriculture is the principal pesticide regulatory and control unit in the State. The Board has subcontracted the pesticide applicator training to the Kansas State University Extension Service. In addition to the program offered through the Board of Agriculture, the Department of Health and Environment operates a Pesticide and Vector Control Program.

The Board of Agriculture employs a total of 23 professionals in its pesticide programs: 7 entomologists, 3 chemists, 1 plant pathologist, 1 technician, and 11 others. The Board predicts only a slight increase in staffing during the next five years: two entomologists and three clerks.

The State Extension Service operates the pesticide applicator training through the assistance of a crew of 13 program staff members, 13 University instructors, and 100 county extension agents. As the program grows, the Service anticipates that its program staff will approximately double during the next five years.

The Pesticide and Vector Control Section of the Kansas Department of Health and Environment currently employs one sanitarian. During 1978, the Section proposed to add one position. The position would operate a Nuisance Bird Control Program.

Private sector workforce estimates include 360 commercial pesticide applicator firms with an average crew of 3.5 persons and 80,000 farmers who apply pesticides. The number of commercial applicators is expected to increase by 5-10% annually for the next five years.

IV. POTABLE WATER

The Bureau of Water Supply located in the Kansas Department of Health and Environment is the state lead agency for Kansas potable water programs. The Bureau's program operations consist of plan, specification, and permit application review, engineering field appraisals, post-construction inspections, collection of samples, and training of operators. The Bureau is currently staffed with six persons and receives part-time staff support through the six district Department of Health Offices. Their combined effort consists of 8 engineers and 2 engineering technicians. In addition to the support provided through the district offices, the Bureau receives laboratory services from the Office of Laboratories and Research. The Office provides the Bureau with an additional 9 person-years of effort annually. The Bureau is expected to grow by about 17% per annum during the next five years. This growth is related to the Safe Drinking Water Act Program. The amount of support provided by the Office of Laboratories is expected to increase to 16 person-years.

There are an estimated 2,300 persons employed in public water supply programs in the state. Growth in the public water supply workforce requirements are expected to be minimal within the next five years, with growth related to expanded program operations and extension of services to small communities.

V. RADIATION

The Bureau of Radiation Control located within the Kansas State Department of Health and Environment is the primary environmental radiation and radiological health administrative agency within the state. The Bureau is currently staffed with three full-time professionals, three technicians, and two clerical positions. Two of the professionals are health physicists, and one is an administrator. There has been no growth in the Bureau during the past two years. Nevertheless, during the next five years the Bureau expects to expand its staff by three positions: 1 health physicist, 1 radiation control inspector, and 1 radiation production specialist. Growth in the Bureau is a consequence of more complex X-ray equipment and non-ionizing radiation devices, the Safe Drinking Water Standards, the proposed Wolf Creek Nuclear Reactor Plant, and the Environmental Surveillance and Emergency Response Program.

Environmental workforce projections for the private sector are difficult to assess. Professional estimates indicate that universities, hospitals, and physicians/dentists account for a major proportion of the private sector radiation programs. In addition, there are approximately fifteen companies in the state that are involved with industrial well-logging. They employ an estimated two to three persons per industry. Increases within the private sector are expected to be slight during the next five years.

VI. SOLID WASTE

Kansas solid waste programs are managed through the Bureau of Environmental Sanitation of the Kansas State Board of Health and Environment. Two sections of the Bureau are involved with solid waste management: the Solid Wastes Management Section and the Recreational Sanitation Section.

The Solid Wastes Management Section is currently staffed with three professionals, three technicians, and one secretary. All the professionals have background and experience in sanitary engineering. The Solid Wastes Section will experience limited growth during the coming five years: by 1982, the Section will be staffed by six professionals and four technicians.

The Recreation Sanitation Section employs two professionals: 1 sanitary engineer and 1 sanitarian. Less than fifteen percent of the Section's time is allocated to solid waste related activities, e.g., 0.4 person years. Little change is expected in the number of person-years allocated to solid waste activities during the next five years.

There are 160 sanitary landfills in the state which are staffed with 286 persons: 180 equipment operators, 80 gate operators, 20 laborers, and 6 weighmasters. There are 296 collection systems which provide service to state residents; estimates indicate that 640 persons are employed in collection system occupations. There are no hazardous waste or resource recovery programs in the state. Five percent growth per annum is expected in the sanitary landfill and collection system workforce requirements during the next five years.

VII. WASTEWATER

The Bureau of Water Quality of the Kansas State Department of Health and Environment is responsible for wastewater regulatory programs. The Bureau is staffed with 76 professionals: 50 at state headquarters and 26 in district offices. The majority of the professionals have training as engineers, geologists, biologists, or engineering technicians. The Bureau estimates an 11% per annum growth, with the greatest increase in the engineering and engineering technician categories.

The Office of Laboratories and Research provides 2.2 person-years of laboratory assistance to the Bureau. The Office plans to expand its effort of commitment to 3 or 3.5 person-years per annum by 1981.

Several other agencies involved in the wastewater area are: Division of State Planning and Research, Kansas Water Resources Board, the State Conservation Commission and four regional planning commissions. A total of 30 additional persons are employed in wastewater activities through these agencies.

Private sector workforce estimates include 1,200 local treatment plant employees, 625 petroleum company employees, 300 persons working in commercial laboratories, and an undetermined number of employees in industrial wastewater treatment plants and local conservation district programs. Minimal growth is expected in the private sector during the next five years.

VIII. ENERGY

The Kansas State Energy Office administers a comprehensive energy planning program which emphasizes both conservation and research and development. Three of the state's universities, Wichita State University, Kansas State University, and Kansas University, have conducted approximately $1.9 million dollars worth of reasearch in energy related fields during the past year.

The Kansas State Energy Office is currently staffed with five full-time persons: one program director, two assistant directors, one fuel allocations specialist, and one secretary. The Energy Office does not predict any growth in staffing during the next five years; and, in addition, if state and federal funds are not continued at the same level, the office may experience some decrease in staffing.

No information is available on the number of persons employed in research efforts through the three state universities. Nevertheless, some growth is expected in the amount of research conducted in the energy field during the next five years.

The Attorney General's Office has one full-time attorney, who has designated responsibility for energy programs. The Office predicts that one or more new positions may be created during the next five years.

Private sector workforce statistics were not available; however, growth in programs is anticipated as the Wolf Creek Nuclear Power Plant is completed in 1983.

STATE OF KANSAS - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	3,534	3,709	3,890	4,073	4,286	4,500	5%
NOISE[1]	6	6	8	8	8	8	n/a
PESTICIDES[2]	49	51	61	66	71	76	n/a
POTABLE WATER[3]	19	24	28	31	37	38	n/a
RADIATION[4]	8	8	8	10	10	11	n/a
SOLID WASTE	1,033	1,049	1,062	1,078	1,129	1,146	2%
WASTEWATER[5]	108	120	132	143	147	151	7%
ENERGY[6]	11	11	11	12	12	13	n/a
TOTALS	4,768	4,978	5,120	5,148	5,699	5,930	4%

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[1] The above does not include private sector projections.

[2] The figure includes only state agency and instructional personnel. Additional workforce projections include 100 county extension agents, the estimated 1,260 commercial applicators, and 80,000 farmers. The number of commercial applicators is expected to grow by 5-10% per annum.

[3] The above includes state effort in terms of person years. Private sector projections for the more than 2,300 public water supply programs have not been included.

[4] These figures include only the state workforce. Projections on the private sector are limited.

[5] The above includes projections for state and regional agencies only. It does not include the estimated 1,200 local treatment plant employees, the 625 petroleum company employees, the staff at the 360 industrial waste treatment plants, the local staff of the 105 conservation districts, or the 300 persons employed in commercial laboratories.

[6] The above includes state staff only.

EDUCATION

Environmental education programs are available only on a limited basis in Kansas. The University of Kansas located in Lawrence has a well developed Environmental Health Engineering program. Advanced degrees, M.S. and Ph.D., are offered through the program. An undergraduate degree, Bachelor of Arts, is also available in Environmental Studies. The Environmental Studies program is an interdisciplinary program. The undergraduate degree program was developed only recently, 1974; however, the advanced degree programs have been operational since 1961 and 1964 respectively.

Ottawa University of Ottawa, Kansas is in the process of developing three in-depth study programs with concentration in the environmental field: Interpretive Ecology, Research Ecology, and Environmental Resource Management. During the school year 1976-77, students were enrolled in the program for the first time.

Other than the two programs mentioned, environmental education programs are available only on a limited basis. Most colleges and universities in the state offer individual courses in ecology, man's environment, and environmental biology. However, little in the way of comprehensive environmental program majors is currently available.

LEGISLATION

The environmental/energy legislation for Kansas was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air Quality Control Act
Agricultural Chemical (Economic Poison) Act
Kansas Pesticide Law
Public Water Supplies Law
Nuclear Energy Development and Radiation Control Act
Solid Waste Management Act
Certification of Operators Law
Water Supply and Sewage Law
Kansas Statutes Pertaining to Water Pollution Control

National Environmental Energy Workforce Assessment

Phase I

KENTUCKY

State Summary

I. AIR

The Kentucky Department for Natural Resources and Environmental Protection is responsible for the commonwealth's air pollution control program. The Department's Division of Air Pollution Control has 126 authorized positions, 111 of which are filled. The professional staff is composed of engineers, air pollution investigators and environmental control inspectors. By 1982, the Division plans to recruit between 35 to 45 persons to increase its total staff to 168.

Kentucky has one local air pollution agency, the Air Pollution Control District of Jefferson County in Louisville. This office employs 39 persons, chiefly engineers and technicians. Agency officials do not anticipate any personnel growth by 1982.

Program officials estimate that there are over 1,000 persons employed by both the public and private sectors to abate air pollution in Kentucky. This includes the estimated one person for each of the state's 774 major installations employed for air pollution control on either a full- or part-time basis. Commonwealth officials anticipate that the private sector will need to recruit additional air pollution control personnel in the next five years.

Approximately eighty percent of the positions projected to be recruited by the Division of Air Pollution Control are environmental specialists, environmental control inspectors (a technician position) and environmental engineers. Also, more technicians may be recruited in the next five years if the Division begins a motor vehicle inspection and maintenance program.

II. NOISE

The Department for Natural Resources and Environmental Protection is authorized to develop and maintain a comprehensive program of state noise regulation. Regulations have not yet been adopted, so the state currently has no regulatory authority. Industrial noise has been identified as the state's major noise problem, although a program is envisioned that would provide protection to the public from all sources of excessive environmental noise.

Two professionals in the Department currently work full-time for the environmental noise control program. As a noise program is implemented, personnel in the regional offices of the Division of Air Pollution Control will be utilized on a part-time basis for monitoring and enforcement purposes. The number of persons for full-time noise control activities in the headquarters office is not expected to increase. Within several years after program implementation, Division administrators expect that one full-time noise control person will be placed in each of the six regional offices. The program will probably not require workforces in the local public agencies.

When enforcement begins, industries will find increasing needs for persons with expertise in the field. Demands will be greatest for highly skilled degreed persons with backgrounds in physics, engineering and acoustics. Demands may also increase for architects with expertise in noise baffling techniques.

III. PESTICIDES

Implementation and enforcement of Kentucky's pesticide laws are charged to the Department for Natural Resources and Environmental Protection. Sixteen professionals in the agriculture field work in registration, certification and enforcement. Three scientists work in a pesticide laboratory. The Kentucky Cooperative Extension Service utilizes twelve extension specialists to train commercial applicators, and 120 county agents train private applicators. Ten students are hired during the summer for alfalfa field scouting.

The Department's Pesticide Section estimates that 2,500 commercial applicators will require certification. An additional estimated 1,500 public operators, 10 consultants and 2,000 dealers will require certification. The number of farmers requiring certification is estimated at 125,000.

At least eight to ten additional persons will be added to the Pesticide Section within five years, including inspectors, entomologists and secretaries. The number involved in training of commercial and private applicators is not expected to increase, although the number of alfalfa scouts could quadruple. State sources believe that the pest control workforce in the private sector will remain relatively stable, although shifts between commercial categories may occur. The number of consultants may increase to 50 or 100, and these persons may begin hiring technician-level scouts. The number of private applicators may increase.

IV. POTABLE WATER

The Kentucky Department for Natural Resources and Environmental Protection carries out the state's safe drinking water program. The commonwealth proposes to assume primacy for the Federal Safe Drinking Water Act beginning July 1, 1977. The agency's current potable water staff is 18. The agency anticipates increasing this staff to 43 by 1982 to meet the demands of the Act. Engineers, as well as technical support personnel, will be utilized.

Commonwealth law requires that there must be a certified operator in charge of water treatment plants. There are currently 601 certified operators of treatment plants and 116 operators of distribution systems. However, many plants and systems as yet do not have certified operators. Hence, program officials plan to train and certify a total of 2,124 operators over the next five years: 1,275 plant operators and 849 distribution system operators.

The Department sponsors an annual certification program for water plant and system personnel. Operator training is conducted through one central seminar and eight regional workshops. As enforcement of the certification law continues, there will be a need for expanding educational/training opportunities for operators. At the present time, plants are experiencing difficulty in locating certified/qualified applicants for available positions.

V. RADIATION

The Office of Radiation Control of the Kentucky Department of Health is responsible for the state's radiation protection program. The Office monitors radioactive emissions to the environment, inspects facilities and issues licenses to users of radioactive materials. Inspection and registration of X-ray machines, microwave and laser devices are also carried out. The Office currently employs 22 persons: 9 health and radiation physicists, one chemist, one biologist, four technicians and 7 other personnel. This staffing level may increase to 26 within several years, chiefly for a certification program for radiation producing equipment operators. Additional inspectors, the number yet undetermined, may be required for an intensification of the radiation producing machine regulation program, specifically for non-ionizing radiation sources.

State sources project that the career potential for health physicists will be good during the next five years in the private sector. The number of consultants is increasing, and nuclear reactors are being constructed in the state that will require health physicists on staff.

VI. SOLID WASTE

Solid waste management control functions are assigned to the Kentucky Department for Natural Resources and Environmental Protection. The Department's Division of Solid Waste currently employs 33 people, chiefly engineers and scientists. This Division may be reorganized and will expand in order to carry out the mandates of the Federal Resource Conservation and Recovery Act of 1976. Officials anticipate that within several years, approximately 80 positions will be added to the solid waste program, chiefly professionals such as engineers, geologists, hydrologists, toxicologists and chemists

There are an estima[illegible]0 landfill operators in the state. There are no specified hazardous waste disposal sites in Kentucky, although the Division is conducting a survey which will supply information for developing a statewide hazardous material program. Resource recovery systems have not been established in the state as this has not proved to be a viable alternative. The number of landfill operators is expected to remain relatively stable. The future of the hazardous waste management workforce will largely be contingent on the type of management program that is developed by the Division.

The Division recognizes a need for upgrading operator skills, and is in the process of forming a program of information and education geared toward landfill operators. Plans have not been completely formulated but needs are being surveyed.

VII. WASTE WATER

The control of water pollution in Kentucky is chiefly carried out at the state level by the Department for Natural Resources and Environmental Protection. The Department anticipates assuming NPDES permitting authority within several years. There are approximately 114 positions budgeted to the water quality program, chiefly engineers and scientists. By 1982,an estimated 33 additional persons will be required, again engineers and scientists for expansion of existing programs and implementation of the NPDES program.

State officials estimate that there are approximately 1,400 certified operators of wastewater treatment plants in the state, with the majority being at the lowest level, Class I. There are an estimated 800 uncertified operators in the state. As enforcement increases and plants become more complex, the number of certified operators is expected to increase dramatically. Approximately 400 new certificates are expected to be issued each year during the next five years. A general upgrading of skills will be required.

The Department takes several approaches in training wastewater treatment plant operators. An annual school is offered, as well as eight four-day courses for Classes II, III and IV, and 25-30 one-day classes annually for Class I operators. This program may be expanded to include on-the-job training. Sources indicate that future training needs can be met if increased personnel and monetary needs are met.

VIII. ENERGY

The Kentucky Department of Energy was established in 1975, and is the state's lead energy agency. A Kentucky Energy Resources Advisory Commission advises the Commissioner of Energy and the Secretary of Development on all phases of the Kentucky energy program. The Department employs 20 persons, including geologists, political scientists, and engineers. The Department will coordinate an energy conservation program under the provisions of the Energy Policy and Conservation Act (EPCA). Various other state agencies will assist in implementing this program. The Department may increase its staffing level to 28 within five years. Increased numbers of personnel will become involved in energy conservation programs in other participating agencies. Highly skilled engineers, architects and scientists will be required in the private sector for meeting the demands of EPCA.

A major portion of Kentucky's energy-related workforce is located within the coal mining industry. Environmental controls have promoted the usage of professionals such as geologists, civil, mining and chemical engineers, reclamation specialists, and chemists to assist in meeting requirements. Field research suggests that demands for these professionals should significantly increase as the use of coal increases and environmental requirements become increasingly stringent. As new technologies become available, such as coal liquifaction and gasification, there will be a demand for highly skilled scientists and engineers.

COMMENWEALTH OF KENTUCKY - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	165	169	184	199	205	207	5%
NOISE[2]	2	2	8	8	8	8	60%
PESTICIDES[3]	163	171	182	190	197	203	4%
POTABLE WATER[4]	735	999	1,265	1,514	1,792	2,067	23%
RADIATION[5]	23	26	26	26	26	26	3%
SOLID WASTE[6]	193	193	250	292	292	292	9%
WASTEWATER[7]	1,500	1,915	2,323	2,732	3,140	3,547	19%
ENERGY[8]	20	22	24	26	28	28	7%
TOTALS	2,801	3,497	4,262	4,987	5,688	6,378	18%

[1] Includes the state and local programs. An estimated 835 persons service the field in the private sector.

[2] Includes state agency. Not included is the private sector, where it is anticipated that needs will increase for experts in the field.

[3] Includes lead agency, State and county extension and alfalfa scouts. Does not include an estimated 2,500 commercial applicators, 1,500 public operators, 10 consultants, 2,000 dealers and 125,000 private applicators. The commercial applicator workforce is expected to remain stable; the number of consultants may increase to 50-100; the number of private applicators may increase.

[4] Includes state personnel (1976=18; 1981=43) and operators of water treatment plants and distribution systems.

[5] Includes the state agency. Additional increases could occur if the non-ionizing program is expanded. Workforce growth may occur in the private sector.

[6] Includes the state agency (1976=33; 1981=83) and the estimated number of landfill operators. Increases may occur for hazardous wastes and resource recovery.

[7] Includes the state agency (1976=100; 1981=147) and certified wastewater treatment plant operators.

[8] Includes the state lead energy agency.

EDUCATION

There are six educational institutions throughout Kentucky that offer environmental curricula which are intended to produce graduates prepared to move directly into environmental careers. The programs offer degrees ranging from the B.S. to Ph.D.

Western Kentucky University in Bowling Green and the University of Louisville offer B.S. degrees in Environmental Engineering. Students explore aspects of pollution and waste disposal as well as engineering problems and related studies. Students in the Louisville program may also qualify for an M.S. degree.

Georgetown College in Georgetown and Western Kentucky University provide B.S. programs in Environmental Science; Morehead University in Morehead offers a B.S. Environmental Studies major with four options, in Ecology, Geology, Social Sciences and Economics and Chemistry and Physics; and Eastern Kentucky University in Richmond presents B.S. programs in Environmental Sciences and Public Health with an Emphasis in Environmental Health.

Civil Engineering degrees are granted on the B.S. and M.S. levels at the University of Louisville and on the B.S., M.S., and Ph.D. levels at the University of Kentucky in Lexington. The latter University also offers an M.S. degree in Nuclear Engineering.

LEGISLATION

The environmental/energy legislation for Kentucky was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Law
Pesticide Use and Application Act of 1972
Garbage and Refuse Disposal Law
Department of Energy Law
Strip Mining Law

National Environmental Energy Workforce Assessment

Phase I

LOUISIANA

State Summary

I. AIR

The State of Louisiana does not have widespread and serious air pollution problems. There are several densely populated areas in the state which contribute to the decline of air quality in the particular area. Problem areas are Baton Rouge, New Orleans, the corridor which extends along the Mississippi between these two cities, and the Lake Charles-Westlake area. One of the major factors contributing to the relative lack of serious air quality problems is the utilization of clean natural gas for power generation and space heating. Since 1964, the Louisiana Air Control Commission has been the exclusive agency for control of air pollution in the state. The Air Control Commission is contained within the Division of Health Maintenance. The Bureau of Environmental Health, Air Control Section is the responsible body of the Division.

Personnel have estimated a no growth pattern for the Air Quality Section over the next three to five years, although program activities and responsibilities are increasing. The no growth projection is predicated on restricted state funding.

The Louisiana Attorney General's Office has indicated that the state's air pollution laws are difficult to enforce because they were written in such broad terminology. The state statutes currently define violation of pollution standards in a way which leaves the state with limited enforcement capabilities.

II. NOISE

Currently, in Louisiana there is no state legislation regarding noise pollution control and abatement. Because no legislation exists, there is no agency with authority to direct a noise program on the state level.

Due to the fact that the state does not conduct a noise pollution control and abatement program, there is no workforce to profile at this level. There are two cities which currently have municipal noise ordinances. These communities are New Orleans and Baton Rouge.

Ordinarily, the workforce at the local level and in the private sector, also, is composed of persons who are utilized in more than one area. For example, law enforcement officials are the usual major component of this workforce and these personnel have other responsibilities apart from noise pollution control and abatement.

The noise pollution control and abatement field in Louisiana will see minor increases within the next few years. As populations increase and people become more aware of the dangers to health of noise pollution, a workforce will emerge.

Career opportunities will be exceedingly limited in this field in Louisiana at least until 1980. By the early 1980s, programs on the municipal level and in private industry will begin to develop which should present increased opportunities.

III. PESTICIDES

The state lead agency in Louisiana for regulating the use and control of pesticides is the Department of Agriculture. The Bureau of Entomology Services within the Department has responsibility for administering the Structural Pest Control Law and regulations; the Bureau of Technical Services administers the Louisiana Pesticide Control Act,which is more agriculturally related.

The Bureau of Technical Services within the Department of Agriculture has been designated as responsible for pesticide applicator certification and training. Recent training and certification activities have been carried out jointly by the Bureau and by the state Extension Service. The Bureau works closely with agricultural personnel at Louisiana State University in this regard.

The workforce profile includes 34 persons at the state level, 1,784 commercial applicators and 70,000 private applicators.

At the present time, it is anticipated that there will be very little growth in state agency pesticide programs. Some growth has occured since 1975 in response to Amended FIFRA. Once the private sector certification program is finished, little growth in this area is likely to occur. Certain demand adjustments may have to be made, however, leading to minimal growth.

IV. POTABLE WATER

Louisiana is a state with many good water resources. Throughout Louisiana, most public water supplies are obtained from groundwater. Groundwater supplies are more frequently available, except in coastal portions of the state, and generally require less treatment than surface water. Surface water is generally abundant although its quality is more dependent on the source. Rivers such as the Mississippi, Atchafalaya, Pearl, Sabine and Red, and lakes such as Toledo Bend and Maurepas are the major surface fresh water bodies in the state.

Regulatory and enforcement activity for the state's potable water supplies is primarily the responsibility of the Bureau of Environmental Health within the Department of Health. The Bureau of Community Health Services within the same department also has a role in ensuring high quality water supplies.

Expansion of the state staff to fulfill the safe drinking water program will be concluded in 1977. While present workforce needs in the area are fairly clear, future needs cannot be determined until the agency becomes operational. Engineers and chemists will fill most professional positions. Louisiana has a well-developed program of water supply and distribution operating personnel, and it appears to be capable of meeting future needs in the area.

V. RADIATION

The State of Louisiana has a broad and comprehensive program of radiation control. There are several nuclear generating stations within the state and several more proposed over the next five years. Louisiana has been an agreement state since 1967. As of December 31, 1975, the state had 463 licenses for by-products, sources, and special nuclear materials. The NRC maintains 15 of these.

The primary responsibility for radiation control in Louisiana has been allocated as of 1973 to the Department of Conservation, Natural Resources and Energy, Division of Radiation Control. The Division of Radiation Control has had no growth during the past two years. Four additional positions have been requested, however, for fiscal year 1977. The workforce, other than the state personnel, should experience an overall increase of three percent per annum over the next five years.

Career options will be available in the radiation control field in Louisiana. The most numerous opportunities will be at the degreed level and secondly at the technician level. The field of radiation control requires educational achievements and practical experience. Less than two years of techncial training will make finding a job difficult. Degreed and postgraduate personnel will see availability of careers in this field.

VI. SOLID WASTE

Louisiana is constrained in solid waste disposal options due primarily to the physical characteristics of the state. Although the state is described as 48,523 square miles, only 35,068 are considered dry land. The remainder of the area is water, salt marsh, fresh water marsh or swamp. Solid waste disposal in wetland areas presents unique and exceedingly difficult engineering problems. Probably the most prevalent problem in Louisiana regarding solid waste management is the availability of disposal sites. In many areas there is a scarcity and absence of cover soil at the site.

The State Department of Health, Bureau of Environmental Health, Solid Waste and Vector Control Section administers the program of solid waste management throughout the State of Louisiana. Other Divisions of the Department and agencies contribute resources of workforce and time although usually to a limited degree.

Department of Health personnel have indicated that there are approximately 250 to 300 sanitarians working across the state in solid waste. A conservative estimate of jumpers and drivers and miscellaneous personnel statewide would be 1,000 persons.

The program is now, was previously, and perhaps will continue to be understaffed due to inadequate funding. However, increases of approximately 15% per annum may occur at this level. A three to five percent per annum increase is anticipated in statewide personnel.

VII. WASTEWATER

Two state agencies share responsibility for the bulk of Louisiana's water pollution control program. The Stream Control Commission is the state lead agency in water pollution matters and performs both regulatory and coordination functions.

The Bureau of Environmental Health within the Department of Health also has significant water pollution control authority. Municipal waste source control, construction grant fund administration, and sewage treatment project approval are among the main activities of this Bureau.

The two major agencies in water pollution control, the Division of Water Pollution Control and the Bureau of Environmental Health, total 78 personnel, and there are 585 certified wastewater operators in Louisiana in four different classifications.

The Division of Water Pollution Control had a staff of only 15 persons in 1970, and has undergone significant growth in 1975 and 1976. Very little growth is expected in this Division over the next five years. Any hiring will be to replace turnover.

While they were unable to make year-by-year projections, Bureau of Environmental Health personnel do anticipate workforce growth. The Bureau is understaffed by 25 positions at present and it is hoped that these positions can be added over the next five years along with other needs as they arise.

VIII. ENERGY

Louisiana is an energy producing state and vast mineral reserves play a major role in the state's economy. Louisiana ranks second only to Texas in value of minerals produced due, for the most part, to oil and gas reserves.

The state lead agency in energy-related activities has been identified as the Louisiana Division of Natural Resources and Energy. This Division is under the aegis of the Department of Conservation. The Division had 99 positions authorized but only 37 were filled. One of the main problems identified in Louisiana is the comparatively low salary scale. The salary contributes heavily to the vacancy rate. The turnover rate is high,also, by comparison to some of the other environmental control categories. No firm figures are available at present for the private sector.

There is little evidence to support staff increases in the Division over the next few years, although responsibilities will continue to increase. Slight increases in the private sector should indicate a two percent per annum growth.

The workforce involved in energy pollution control and abatement will experience incremental increases over the next three to five years. New career options could emerge from the energy related activities of the state. These, most probably, will be at the degreed level in the scientific and technologically advancing fields.

STATE OF LOUISIANA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	27	27	27	27	27	27	0%
NOISE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES[2]	1,783	1,789	1,790	1,791	1,791	1,791	N/A
POTABLE WATER[3]	926	972	1,020	1,070	1,123	1,178	5%
RADIATION[4]	5,014	5,164	5,323	5,482	5,646	5,815	3%
SOLID WASTE	1,007	1,037	1,073	1,106	1,241	1,275	5%
WASTEWATER[5]	663	692	723	755	789	825	4%
ENERGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTALS	9,420	9,681	9,956	10,231	10,617	10,911	3%

[1] Does not include private sector.

[2] Does not include private applicators; reflects no growth in commercial applicators.

[3] Reflects no growth at state level.

[4] The above includes some 5,000 persons involved in the usage of radioactive materials.

[5] Does not include state agency projections.

EDUCATION

Environmental course offerings are more readily available in Louisiana than are degree programs. The state has at least 25 post-secondary educational institutions not including the multicampus schools, and several of these offer environmentally related programs.

The Louisiana State University at Baton Rouge, through the College of Agriculture, conducts a program in Environmental Health which can lead to a Bachelor of Science degree. In addition, LSU, through the Division of Continuing Education,maintains several institutes. The Institute for Environmental Sciences is a center for the study of problems associated with air and water pollution. The Louisiana Water Resources Research Institute emphasizes projects that have a significant training feature for students in the fields of hydrogeology, surface and groundwater, and the legal, engineering, and economic phases of water development.

The Nuclear Science Center at LSU utilizes specialized equipment and laboratories to accommodate many educational and research activities which utilize nuclear energy technology. Located also at LSU is the School of Environmental Design. This School coordinates those disciplines which traditionally have been responsible for the design and management of the environment.

Mcneese State University at Lake Charles offers an Environmental Science curriculum which leads to the Bachelor of Science and the Master of Science degree. Tulane offers several post graduate programs.

LEGISLATION

The environmental/energy legislation for Louisiana was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Council on Environmental Quality Act
Air Control Act
Pesticide Control Act
Industrial Waste Disposal Act
Stream Control Commission Law
Water Supply and Sewerage System Law
Natural Resources and Energy Act of 1973

National Environmental Energy Workforce Assessment

Phase I

MAINE

State Summary

I. AIR

Maine's air pollution control program is located in the Department of Environmental Protection. The Bureau of Air Quality is composed of 19 persons with engineers, chemists, and engineering technicians predominating. The Bureau experiences difficulty in recruiting engineers for pollution control jobs because it is felt by program administrators that the state lacks an adequate supply of experienced professionals in this field.

Bureau officials do not anticipate increasing their staff by 1982. Four positions are currently vacant and it is anticipated that they will be filled. If state or federal monies do become available, the Bureau may add a meteorologist and two additional engineers to its present staff by 1982.

Maine does not intend to initiate a mandatory inspection and maintenance program for vehicular emission control. Career potential for air pollution control and abatement jobs appears to be rather limited for the next five year period.

II. NOISE

The State of Maine currently lacks any noise control legislation; however, two departments do share responsibilities in noise abatement and control. The Maine Department of Transportation is charged with Environmental Impact Statement (EIS) review if noise assessments are included. This agency also regulates motor vehicle and powerboat mufflers within the state. The Maine Department of Human Services is charged with responding to any noise complaints within the state; however, again, they operate with no legislative mandate. Within this agency, the Division of Health Engineering has primary responsibility and it has been said that considerably less than one person-year is devoted to noise control. Noise is generally not a problem in Maine due to the state's rural nature; thus it does not appear likely that a formal program with legislative directives will be developing in the near future.

III. PESTICIDES

The new Pesticide Control Act of 1975 provides for the registration of all pesticides sold or distributed in the state. All pesticides are to be classified as to restricted or general use and all applicators using restricted-use pesticides must become certified under the authority of the act.

The Maine Department of Agriculture is charged with responsibility for administering Maine's pesticide laws. The Board of Pesticides Control employs a small staff to handle the day to day operations of pesticide regulatory matters such as investigating complaints and licensing both applicators and dealers.

The Board of Pesticides Control is responsible for both commercial and private pesticide applicator certification within Maine. The Maine Cooperative Extension Service assists in providing applicator training and the Division of Inspection is charged with the registration of all pesticide products marketed within the state. The Board is staffed by a supervisor, a coordinator, and a secretary. The Division of Registration is staffed with a supervisor, three inspectors, and one clerk. Minimal or no growth is projected for the pesticide regulatory staff for the next five years.

State officials anticipate that a total of 2,636 commercial and private pesticide applicators will be certified by October 1977. No increase in the size of the applicator work force is projected through 1981.

IV. POTABLE WATER

The Division of Health Engineering (DHE) of the Maine Department of Human Services' (DHS) Health Bureau is responsible for administering Maine's Drinking Water Program. DHE's activities are supplemented by the Bureau's Public Health Laboratory which tests drinking water for its safety.

The water supply program in the State of Maine is proceeding according to schedule to accept primacy under the federal Safe Drinking Water Act. The necessary legislative mechanism is in place to comply with all federally promulgated standards under PL 93-523.

Since 1974, only one professional employee was added to the staff of the drinking water program. Employee turnover to date has been negligible (less than one percent per annum) and is the result of an extremely limited job market within the state.

Future growth through 1981 will be totally dependent on financial assistance available from EPA and SDWA. State funding of the water supply program is not likely to grow. This stems from the fact that the state's priority commitment to its wastewater treatment facility construction grant program has precluded any increased assistance to the water supply program. It is estimated that 21.2 person-years will be required in FY 1977 and 24.2 person-years will be required in FY 1978 for the implementation of SDWA. It has been suggested that the potential addition of three positions will be utilized for community system compliance with regulations promulgated under SDWA pursuant to state acceptance of primacy.

V. RADIATION

The radiation program of the State of Maine is located in the Division of Health Engineering of the Maine Department of Human Services. The Institutional Health Program of the Division of Health Engineering is the state's principal radiation control group. The Public Health Laboratory, also of the Department of Human Resources, provides environmental sample analysis capabilities for the program.

The Institutional Health Program has a radiation control staff consisting of a director, a radiological chemist, and a technician. Only the radiological chemist devotes full time to radiation control. The technician, who conducts field samples, devotes one day per week to collection of radiological samples.

There are no projected increases in workforce devoted to radiation control within Maine over the next five years. There are no nuclear power plants scheduled to come on-line within the next five years. Career potential at the state level should not develop until 1981 when a second nuclear power unit is scheduled to become operational, thereby increasing the program's monitoring responsibilities.

VI. SOLID WASTE

The Division of Solid Waste Management is the arm of the Department of Environmental Protection responsible for implementing a comprehensive statewide management plan. Educational resources, technical assistance, and cooperation are all tools utilized by the Division to ensure compliance with the state plan. The state plan has basically five specific areas of concern. They are as follows: 1) resource recovery; 2) incineration; 3) storage and transfer facilities; 4) land disposal; and, 5) variance procedures and conditional use permits.

The Division of Solid Waste Management is primarily staffed with sanitary engineers, geologists, engineering technicians, and a geology technician. The effect of the new Resource Conservation and Recovery Act of 1976 on the solid waste program in Maine is indeterminable at this time. Limiting factors include the extent and degree to which federal requirements and standards are promulgated, as well as the federal funding to support the state's program. Most likely, two or three additional positions will be created over the next five year period. Specifically, a soil chemist, a sanitary engineer, and a geologist will be requisitioned pursuant to an increase in Maine's federal grant.

At this time, no provisions have been made for a hazardous waste management plan. The impact which the new federal act will have on the state workforce devoted to develop this task is presently unknown.

VII. WASTEWATER

The wastewater program in Maine is administered through the Bureau of Water Quality Control (BWQC), which has the largest percentage of personnel of the Department of Environmental Protection (DEP). The Bureau is primarily staffed with assistant engineers, environmental technicians, engineering technicians and chemists.

Specific workforce projections for the Bureau of Water Quality Control in Maine's DEP are indeterminable at this time. However, as Maine assumes more responsibility for water quality programs, such as the NPDES permit program, it is likely that increases in the workforce will follow.

The number of certified treatment plant operators which is now approximately 275, with 150 to 200 working within the state, is expected to increase to four or five hundred over the next five years. A substantial increase in career potential in the wastewater field seems likely to occur at the local level for municipal treatment facilities and in the private sector. This will be the result of expanding construction, operation, and monitoring activities which will lead to a growth in demand for treatment facility operators, as well as laboratory maintenance, labor and clerical personnel.

VIII. ENERGY

Maine is the longest, most northeasterly, and least industrialized of the New England states. Energy consumption is primarily for space heating and is highly oil dependent. One nuclear power generating station, the Maine Yankee Atomic Power Plant at Wiscasset, has been operational since 1972. An additional plant, to be located at Sears Island and operated by the Central Maine Utility Company, is currently in the early planning stages.

For the essential short-term conservation planning and the mid- and long-term efforts which must be developed concurrently, the Maine Office of Energy Resources was established in June 1975. In addition to fuel allocation as specified under the federal mandatory petroleum allocation program, the Office of Energy Resources, which employed eight people in 1976, is responsible for:

1) preparation of a comprehensive energy resource plan;
2) preparation of a state energy policy;
3) encouragement and sponsoring of research and development of alternative energy sources;
4) provision of public information of energy matters;
5) provision of technical assistance to public and private groups for energy planning.

STATE OF MAINE - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	19	19	19	19	19	19	0%
NOISE[2]	2	2	2	2	2	2	0%
PESTICIDES[3]	2,944	(2,944)	(2,944)	(2,944)	(2,944)	(2,944)	0%
POTABLE WATER[4]	331	334	334	334	334	334	N/A
RADIATION[5]	3	3	3	3	3	3	0%
SOLID WASTE[6]	9	--	--	--	--	12	N/A
WASTEWATER[7]	337	--	--	--	--	(550)	N/A
ENERGY[8]	8	--	--	--	--	--	N/A
TOTALS	3,653	--	--	--	--	--	N/A

[1] The above includes only state agency personnel for which no growth is anticipated. Private sector data were unavilable.

[2] The above includes only state agency personnel. Private sector data were unavailable.

[3] The above does not include state laboratory personnel nor the state extension offices personnel.

[4] The above represents 25 state agency personnel as well as 306 certified water treatment facility operators.

[5] The above depicts state agency personnel only and does not include laboratory personnel. Figures for the private sector were unavailable.

[6] The above includes only state agency personnel.

[7] The above includes state agency personnel and certified operators.

[8] The above includes only state agency personnel.

EDUCATION

The Eastern Maine Vocational Technical Institute in Bangor offers a two year course of study in Environmental Control Technology leading to an Associate Degree in Applied Science. The Program was started in 1971 and a total of 78 semester hours are required for this major. Two instructors are assigned to this Program and both have Bachelor of Science degrees. The Program had a 1976 enrollment of 25 students and of the six students which graduated in 1976, four were placed in job-related positions. The Program offers instruction in the basics of microbiology, physics, chemistry, and sanitation and wastewater treatment. Instruction involving the use of environmental control equipment is also offered to students participating in this program. Involvement is also covered by the Program in layout and design of control facilities. It is anticipated that graduates from this Program will be qualified to seek positions in the fields of research, development, sales and operation of environmental control equipment.

Nasson College in Springfield offers a Bachelor of Science degree in Environmental Studies of which there are two major areas: Environmental Studies in Renewable Resources and Environmental Science. There are three options in the Environmental Science major which can provide a student with, according to the College's course description, a "solid scientific background necessary for the systematic study and analysis of environmental problems." The three options offered include Biological Environmental Science, Analytical Environmental Science and Chemical Environmental Science. Nasson College's Environmental Studies Program was created in 1970 and is taught by two professors, one an associate professor and the other an assistant professor. In 1976, the Program had a total enrollment of 18 students of which only one graduated in 1976.

LEGISLATION

The environmental/energy legislation for Maine was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Department of Environmental Protection Law
Protection and Improvement of Air Laws
Board of Pesticides Control Law
Pesticide Control Act of 1975
Water for Human Consumption Law
Great Ponds Law
Solid Waste Laws
Protection and Improvement of Waters Law
Sewage Treatment Operators Law
Oil Discharge and Pollution Control Law
Mining and Rehabilitation of Land Law
Alteration of Coastal Wetlands Law

National Environmental Energy Workforce Assessment

Phase I

MARYLAND

State Summary

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I. AIR

Maryland's air pollution abatement and control functions are the principal responsibility of the Bureau of Air Quality and Noise Control in the Department of Health and Mental Hygiene. The Bureau has a central office in Baltimore and two regional offices. The Bureau has four divisions plus a Noise Section which include Divisions of Program Planning and Analysis, Engineering, Compliance, and Air Monitoring. There are also ten local air pollution control programs in Maryland.

The Bureau has a current total of 84 persons, and professions represented include public health engineers, environmental health assistants, sanitarians, and occupational specialists. Most of the Bureau's professional staff engineers have Master's degrees. Approximately 110 persons with air pollution control responsibilities are presently employed by local programs.

Budget constraints are not likely to increase the staff of either the state or local air pollution control programs by 1982. Bureau officials project that their present staffing level will remain the same but there is a possibility that there may be an increase in technicians if a motor vehicle inspection/maintenance program is initiated. About 120 persons annually attend two visible emission certification sessions sponsored by the Bureau. Bureau staff receive on-the-job training and those who do participate in long-term training for Master's degrees usually obtain them from the University of Maryland or the Johns Hopkins School of Public Health.

II. NOISE

Noise pollution control activities are carried out by the Bureau of Air Quality and Noise Control. The Bureau's Noise Control Section is under the jurisdiction of the Maryland Department of Health and Mental Hygiene. Baltimore, Cumberland, and Rockville all have nuisance ordinances, but they do not include acoustical criteria. Baltimore has adopted zoning noise ordinances which include acoustical criteria but none are included in the city's recreational/vehicle ordinances. The state is responsible for enforcing statewide legislation which applies to regulating motor vehicle mufflers and noise levels across property lines.

The Noise Control Section primarily investigates complaints, performs data analyses, formulates programs, conducts noise surveys, and provides enforcement of statewide noise restrictions. Staff also provide educational assistance to communities in developing model noise ordinances and speak before interested groups. The Section is composed of a public health engineer, a sanitarian, and a clerk. The Section is only specifically authorized to have one position and others are temporarily assigned to assist as needs arise.

State budgetary restrictions are not likely to increase the staffing level of the Noise Control Section by 1982. However, if additional funding does become available, the Section may recruit six technicians to increase its noise monitoring capability. The anticipated availability of federal funds may allow the Section to recruit a sanitarian and an environmental health aide for initiating a labeling program.

III. PESTICIDES

The Maryland Pesticide Applicators Law of 1975 was enacted to comply with the requirements of the Federal Fungicide, Insecticide, and Rodenticide Act (FIFRA) as amended. The U.S. Environmental Protection Agency (EPA) designated the Maryland Department of Agriculture as the lead agency for implementing the training and certification requirements of FIFRA.

Five employees of the Department's Division of Plant Industries have direct involvement with the pesticide applicator training and certification program. Professions represented include a supervisor, three entomologists and an inspector. Two training specialists of the University of Maryland's Cooperative Extension Service provide training with the assistance of nineteen county extension training agents.

In order to enforce state and local legislation, two additional field inspectors are needed by 1980. In addition, two entomologists, chemists, and/or plant pathologists are expected to be recruited by 1982.

The Maryland pesticide program is not anticipated to grow significantly by 1982. Most career potential is projected to exist with commercial applicator businesses.

IV. POTABLE WATER

The state of Maryland intends to assume primary enforcement responsibilities for the federal Safe Drinking Water Act (SDWA). The state currently has 360 public water supply treatment plants, with an additional 440 plants soon to be brought under the jurisdiction of the Act.

The Department of Health and Mental Hygiene's Environmental Health Administration has responsibility for the state's public water supplies. The Department of Natural Resources' Water Resources Administration has permitting responsibilities and develops comprehensive water and sewage plans.

There are about 670 full-time personnel employed at 363 water treatment plants. Because of increased construction and staffing demands, a continual upgrading of treatment-plant personnel skills are required. Most operator training is funded by the state rather than the federal government.

The availability of federal funds as a consequence of preparation for the assumption of primacy for SDWA will allow the Environmental Health Administration to increase the drinking water program staff by 400 percent during fiscal year 1977. Positions included are sanitarians, public health engineers, and environmental health aides (technicians). The number of certified treatment plant personnel is also expected to increase as many operators of small water supply systems will be required to obtain certification.

Training for Water Section personnel of the Environmental Health Administration is primarily on-the-job.

V. RADIATION

Radiation control responsibilities fall under the jurisdiction of the Department of Health and Mental Hygiene's Environmental Health Administration. The Division of Radiation Control has recently acquired legislative authority to initiate a program to control sources of non-ionizing radiation since it already has a program to license and regulate X-ray devices. Maryland is an agreement state with the Nuclear Regulatory Commission (NRC).

Environmental Radiation surveillance activities are the responsibility of the Division's Licensing and Inspection Section. The other section is the X-ray Section. The Division is composed of a chief, three radiation specialists, five health physicists, one environmental health aide and a secretary. A public health radiation specialist and two health physicists are anticipated to be recruited in the next five years (1977-1981) to staff a new section that will be responsible for inspecting and regulating sources of non-ionizing radiation.

Career potential is likely to develop slowly in the public sector and few additional personnel are expected to be recruited for radiological health or environmental radiation control activities. The new state program to control sources of non-ionizing radiation constitutes the only reason why more personnel will be hired by the Division. Career potential is also anticipated to be low in the next five years since the two nuclear power plants currently under construction are not expected to become operational until after 1985.

VI. SOLID WASTE

The Division of Solid Waste Control under the State Health Department's Environmental Health Administration has responsibility for the state's permit program to regulate the disposal of solid waste. About 90 percent of the solid waste generated in Maryland is disposed of by local county governments.

The new Federal Resource Conservation and Recovery Act will enable the Division to recruit chemists, chemical engineers, geologists, and environmental health technicians in the next five years. The Water Resources Administration is anticipated to recruit ten additional planners as a result of hazardous waste legislation to conduct water quality monitoring studies.

State officials anticipate that the principal demand for jobs as a consequence of the new federal act will be in the private sector. Industrial chemical plants are expected to recruit chemists or chemical engineers to conduct research. The Division is encouraging a regionalization program of consolidating landfill sites and additional landfill sites are anticipated to be constructed in the near future, thereby creating a demand for bulldozer operators. Baltimore operates a pyrolysis resource recovery plant which may employ up to fifty people (now employs 34) operating on a twenty-four hour basis if the facility proves to be economically feasible. Such facilities still have to secure markets for the sale of their products, and these markets have been very slow in developing.

VII. WASTEWATER

In Maryland, wastewater pollution control activities are divided between two agencies: the Department of Public Health and Mental Hygiene (Environmental Health Administration) and the Department of Natural Resources (DNR) Water Resources Administration. The Water Resources Administration has authority for issuance of NPDES permits and for 303E River Basin Planning. The Environmental Health Administration has authority over the other water quality assurance programs mandated under the Federal Water Pollution Control Act.

Both the Environmental Health Administration and the Water Resources Administration are expected to increase their staffing levels substantially over the next five years. The Environmental Health Administration's water quality program is expected to increase as additional engineering personnel will be required to assist present personnel assigned to the Construction Grants Unit through Fiscal Year 1981. EHA is actively recruiting chemists, engineers, and sanitarians for their construction grants review program. The Water Resources Administration is also recruiting additional chemists and public health engineers to complement their staff due to the recent passage of state legislation dealing with flood control, hazardous waste and surface mining.

It is evident that the construction grants program will create a demand for qualified operators to operate these relatively complex treatment facilities. The wastewater treatment plant workforce has increased by 58 percent over the past three years and many operators are expected to retire, thus creating an additional demand for personnel.

VIII. ENERGY

The Maryland Energy Policy Office was created by Executive Order of the Governor to allocate petroleum products according to the federal mandatory petroleum allocation program. In July, 1977, the Maryland Energy Policy Office is expected to undergo a reorganization and become part of the Maryland Department of Natural Resources.

The Office is presently staffed with a total of twelve persons including two vacancies. It is anticipated that the Energy Policy Office will have to expand its present staff if it is to handle the programs which it has obtained from federal agencies or which are anticipated to be obtained. Most of the program expansion will be based upon federal grant money. Program administrators anticipate that eight additional personnel may be hired in 1977 to implement additional project responsibilities that have been recently acquired. In order to implement the Office's solar energy research and development grant program, three or four engineers may be recruited. At least one of these engineers must have expertise in the solar energy development field. In addition, a public information officer and several administrative support personnel may be also recruited. Projections beyond 1977 were impossible to obtain because of the program officials' uncertainty regarding the effect of the planned reorganization into the Department of Natural Resources.

STATE OF MARYLAND - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR [1]	185	185	185	185	185	185	N/A
NOISE [2]	1	1	1	1	1	1	N/A
PESTICIDES [3]	32	33	34	35	36	36	3%
POTABLE WATER [4]	714	796	909	1,006	1,099	1,193	11%
RADIATION [5]	12	13	14	14	15	15	5%
SOLID WASTE [6]	22	30	36	42	45	48	17%
WASTEWATER [7]	1,282	1,483	1,616	1,775	1,928	2,081	10%
ENERGY [8]	10	20	20	20	20	20	20%
TOTALS	2,258	2,561	2,815	3,078	3,329	3,579	10%

[1] The above includes only state agency, laboratory and municipal personnel.

[2] The above does not include law enforcement agencies or the private sector.

[3] The above includes 32 state staff but does not include 200-250 public agency applicators, 1,400 commercial applicators and 12,000 private applicators who may be certified by October 1977.

[4] The above includes Environmental Health Administration and Water Resource Administration personnel, Baltimore City Health Department personnel and water treatment plant operators of small water plants which have to obtain certification under SDWA.

[5] The above includes only state agency personnel.

[6] The above includes state agency personnel. Private sector figures were not available.

[7] The above includes state agency personnel and certified operators.

[8] The above includes only state energy agency personnel.

EDUCATION

Several Associate of Art environmental curricula are offered through community colleges in Maryland. Garrett Community College, Charles County Community College, and the Community College of Baltimore award associate degrees in environmental programs. The Community College of Baltimore has a two-year program in Environmental Health Technology. Two training options are available: 1) Environmental Sanitation and 2) Air Pollution Monitoring. Students enrolled in these programs receive instruction in basic science, mathematics, and communication concepts as well as training in the specific environmental discipline.

Garrett Community College awards an associate degree in Estuarine Resource Technology. A Pollution Abatement Technology associate degree program is offered through Charles County Community College. A general curriculum in air, wastewater, and solid waste pollution control management techniques is supplemented with instruction in environmental health and laboratory analysis concepts.

A Master program in Environmental Renewable Resources is currently a career option at Frostburg State College. It has been projected that by 1978, the University of Maryland at College Park will offer two advanced degrees in Marine and Estuary Environmental Science. Degree programs are being designed on both the Masters and Doctoral level.

Individual environmental courses are generally available at most colleges in Maryland. No attempt has been made to complete a survey of these courses.

LEGISLATION

The environmental/energy legislation for Maryland was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Policy Act
Environmental Service Act of 1970
Air Quality Control Act
Environmental Noise Control Act
Pesticide Applicators Law
Pesticide Registration and Labeling Law
Water Resources Law
Water Pollution Control Laws
Shore Erosion Control Law
Strip Mining Law

National Environmental Energy Workforce Assessment

Phase I

MASSACHUSETTS

State Summary

I. AIR

The Commonwealth of Massachusetts' air pollution control program is administered by the Air and Hazardous Materials Division of the Department of Environmental Quality Engineering (DEQE), Executive Office of Environmental Affairs. It is estimated that about 100 persons were employed statewide in air pollution abatement and control functions.

The air program of the Division of Air and Hazardous Materials is presently undergoing a reorganization and reappraisal of program objectives and strategies. Once reorganization is completed, program officials anticipate a redirection of program priorities.

Tentative workforce projections through 1981 suggest that the program will experience a 10 percent growth rate which would result in a staffing of 10 to 12 additional positions. It is anticipated that during 1978, legislation will be introduced which, if enacted, would augment air program activities, resulting in the addition of these positions.

Considerable career potential for skilled automobile emissions control technicians is likely to develop if the state implements an inspection and maintenance (I&M) program as necessitated by its most recent transportation control plan. If the program is initiated, a cadre of trained inspectors will be needed throughout the state to maintain the emission control systems of all registered vehicles.

II. NOISE

Noise control in Massachusetts is administered by the Air and Hazardous Materials Division of the Department of Environmental Quality Engineering (DEQE). Currently within the state there is no legislative mandate for the abatement and control of noise pollution; however, a loose interpretation of existing air laws has enabled the state to develop limited noise regulations. The Registry of Motor Vehicles is responsible for motor vehicle sound emissions; however, only regulation for off-road recreational vehicles and snowmobiles have been promulgated.

About 1.2 person-years are devoted to noise at DEQE's headquarters level. Within the Department's four regional field offices, about 3.5 person years are devoted to noise control and abatement, making DEQE's entire effort about 4.7. At the municipal level, Boston appears to be the only municipality in the state which has one full-time professional engineer regulating excessive sound levels through local ordinance.

Due to the lack of any projected increases in the state noise program staffing levels, the potential for careers in noise control over the next five years will be limited, at best, until either EPA or Massachusetts decides to bolster the program with additional funding. Careers in the private sector will also most likely be a function of federal and state requirements and standards, which are not anticipated to develop in any areas beyond new product noise regulations, at least not within the next five years.

III. PESTICIDES

In Massachusetts, the Pesticide Branch, under the Executive Office of Environmental Affairs, is responsible for all uses and applications of pesticides within the state. The Department of Public Health is responsible for registration of pesticides distributed within the state. Currently, the pesticide law in Massachusetts does not meet the federal requirements promulgated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The state's laws now call for certification of applicators who apply pesticides on land only, which does not satisfy the other types of applicator certification mandated by FIFRA.

Presently, there are four individuals charged with implementing and developing the state's pesticide use program. Workforce projections for the Pesticide Branch of the Division of Environmental Quality Engineering are not determinable as federally acceptable state pesticide laws are not in effect, nor has a state plan been ratified. However, basic training for private and commercial applicators is proceeding on a provisional basis. If a compromise is reached and a state plan for Massachusetts is ratified by the state legislature, then it appears that the greatest potential for career employment with the Pesticide Branch will be for field inspectors.

The only significant workforce increases in pesticide-related careers will occur in the private sector, as it is expected that several hundred applicators will require certification on a per annum basis after the initial bulk of certification is completed.

IV. POTABLE WATER

The Massachusetts water supply program is located in the Department of Environmental Quality Engineering (DEQE) of the Executive Office of Environmental Affairs. It is responsible for testing all water supply systems in the state, for approving all new water systems, resources, and well sites. Currently, the state is developing a program which will satisfy all requirements of the federal Safe Drinking Water Act of 1974 (SDWA). At this time, it is anticipated that Massachusetts will assume primacy under SDWA. Plans and regulations have been submitted to the state legislature for ratification.

Massachusetts state law requires that any individual or local government which sells or distributes water must have a certified operator/distributor present and accountable. Additionally, every city and town must have a certified operator regardless of whether or not the municipal supply requires treatment. Currently within the state there are about 1,200 certified operators/distributors.

The water supply program of Massachusetts is totally dependent on federal funding for any future workforce growth as the program has been ordered by the Governor to effect a ten percent decrease in total state operating expenses over the next four years. Workforce growth/decline is unknown as a result. Standards promulgated under the Safe Drinking Water Act of 1974 are likely to increase the need for technical skills necessary for operating compliance.

V. RADIATION

The Massachusetts radiation control program is located within the State Department of Health and is responsible for monitoring and control of the uses of ionizing and non-ionizing radiation as well as power reactors within the state.

Approximately 4.5 person-years of the program's activities (excluding clerical) are devoted to environmental monitoring, while 5.5 are spent on university/medical monitoring. It is currently staffed with radiological health specialists, chemists, and X-ray technicians. Within the next two years, it is anticipated that the program will add to its staff one nuclear engineer and an additional clerk. Activities should grow in the area of nuclear medicines and non-ionizing consumer products monitoring.

The growth and decline for this program between 1978 and 1981 would not be speculated about by program officials, but it was indicated that the areas of non-ionizing radiation monitoring such as consumer products, should continue to develop and should eventually result in a demand for careers in research and monitoring of these presently unregulated devices. There could develop a demand for researchers as well as technical monitors if legislation is enacted within the state to regulate and control the radiation emitted by these products.

VI. SOLID WASTE

The Bureau of Solid Waste Disposal (BSWD) is located in the Department of Environmental Management of the Massachusetts Executive Office of Environmental Affairs (EOEA). Although regulatory responsibilities are charged to the Division of Environmental Quality Engineering under EOEA, the Bureau of Solid Waste Disposal is considered the primary planning group for solid waste management in Massachusetts.

The statewide plan for resource recovery facility development appears to be aggressive, but perhaps politically unacceptable due to the state legislature's questionable commitment to providing for an adequate state program. The impact of PL: 94-580 is also questionable at this time. The most significant impact of this new law will take the form of aiding Massachusetts in developing a statewide hazardous waste management program. As Massachusetts has exhibited proficiency in resource conservation and recovery, the impact of this Act will not likely be as extensive as it will be in states with no programs in existance. Currently the towns of Marblehead and Sommerville are both operating municipal separate collection solid waste programs under demonstration grants from EPA.

VII. WASTEWATER

The Division of Water Pollution Control (DWPC), in the Department of Environmental Quality Engineering, is the Massachusetts agency concerned with the management of wastewater treatment facilities. This Division distributes construction grants funds to the cities and towns of the state by authority of the Federal Water Pollution Control Act (FWPCA).

The Division is mostly staffed with sanitary and civil engineers. At the local level, there exist approximately 600 wastewater treatment plants in the state. It has been estimated that monies obligated under construction grants program have so far created 7,000 engineering and construction jobs as well as 800 permanent jobs involved in the operation and maintenance of these facilities. Program professionals estimate that, with a substantial amount of funding still to be obligated, about two to three thousand additional engineering and construction jobs may be created. The industrial sector will likely not experience any workforce growth as they are generally in compliance with existing effluent standards.

VIII. ENERGY

The Massachusetts Energy Policy Office is an executive office established to advise the Governor, provide coordination among state agencies regarding outer-continental shelf oil development, and to develop energy conservation programs.

The short term energy goal for Massachusetts is increased energy efficiency. Extensive consumer education efforts have been implemented toward this end. Programs to encourage and promote construction and use of energy-efficient commodities have been developed.

The Energy Facilities Siting Council is composed of four cabinet secretaries and five Governor-appointed citizens. The Council reviews questions of need and choice of sites for gas and electric facilities and major oil facilities.

The Division of Standards, Executive Office of Consumer Affairs, is responsible for fuel allocation. The Boston Energy Office is a quasi-official agency brought about by direct cooperation between government agencies and the academic community. The Office is totally student-staffed and is involved in innovative projects to address energy issues which affect Boston.

COMMONWEALTH OF MASSACHUSETTS - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	600	--	--	--	--	612	N/A
NOISE[2]	7	7	7	7	7	7	0%
PESTICIDES[3]	4414	10414	--	--	--	--	N/A
POTABLE WATER[4]	17	--	--	--	--	--	N/A
RADIATION[5]	13	--	15	--	--	--	N/A
SOLID WASTE[6]	10	--	--	--	--	--	N/A
WASTEWATER[7]	111	--	--	--	--	--	N/A
ENERGY[8]	--	--	--	--	--	--	N/A
TOTALS	5172	--	--	--	--	--	N/A

[1] The above reflects 100 state agency and 500 known private sector personnel.

[2] The above includes approximately six state agency headquarters and field personnel.

[3] The above figure for 1976 includes 4 state agency personnel, 10 Pesticide Board members, 4,000 certified applicators, and 400 pesticide dealers. Growth in 1977 is attributable to an anticipated 10,000 certified pesticide applicators.

[4-8] The above include only state agency personnel.

EDUCATION

The Commonwealth of Massachusetts offers a number of environmental science and pollution control programs through its colleges and universities. A sampling of these programs was conducted and is shown in detail in the complete Massachusetts report. The programs are designed to prepare students for technical and professional positions in pollution control and related fields.

Harvard University offers graduate degrees in Environmental Health Science and Environmental Sciences and Engineering. Options are available in water, industrial, and urban planning areas. Worcester Polytechnic Institute has majors in Environmental Engineering, Sanitary Engineering and Water Resources, and Environmental Planning.

Most environmental education offerings stress inter-disciplinary involvement and the various societal impacts on the environment. A large number of the programs have originated during the 1970's because of increased concern with the environment; enrollment has reflected this growing interest.

LEGISLATION

The environmental/energy legislation for Massachusetts was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Cause of Action Law

Environmental Protection Law

Air Pollution Control Laws

Motor Vehicle Pollutant Control Devices Law

Pesticide Law

Radiation Protection Laws

Solid Waste Disposal Law

Restriction on Out-of-State Rubbish
Acts of 1971

Hazardous Waste Law

Board of Certification of Operators Law

Clean Water Act

Petroleum Discharge Law

Wetlands Protection Laws

National Environmental Energy Workforce Assessment

Phase I

MICHIGAN

State Summary

I. AIR

Primary responsibility for the adiministration of Michigan's air pollution control program lies with the Michigan Department of Natural Resources (MDNR), Bureau of Environmental Protection, Air Quality Division. Division operations are carried out through a central office and nine district offices. The total professional and technical staffing level is currently 52 persons. The central office is staffed by 31 professional and technical persons, and the remaining 21 persons are allocated to the district offices. While staff is needed for program efficiency, insufficient budget allocations will not permit significant growth during the next five years.

Laboratory support for the state air program is provided by the Laboratory Section, Environmental Services Division, MDNR. Three chemists and two laboratory technicians are involved in air analysis. Staff increases of two persons per year are projected for the Section through 1981.

Local air pollution control programs are administered in Wayne County, Macomb County, Muskegon County, and the City of Grand Rapids. A total of 79 persons, mostly engineers and scientists, are employed through these programs. No growth is projected for the next five years.

Sources estimate that as many as 1,000 engineers, scientists, and technicians are involved in air pollution control activities in the private sector. Five percent per annum growth is projected for the next five years.

II. NOISE

The Michigan Department of State Highways and Transportation is the most active state agency in the control of environmental noise. Two divisions of the Department are involved in noise control, the Environmental and Community Factors Division and the Testing and Research Division. In the Environmental and Community Factors Division, two staff members allocate approximately fifteen percent of their time to noise activities, and in the Testing and Research Division, three engineers and one technician are active in environmental noise. Sources indicate that no growth in their staff or in the time spent on noise control activities is expected.

The OSHA industrial noise control program is regulated by the Michigan Department of Public Health, Bureau of Occupational Health and Environmental Health, Division of Occupational Health. This Division has a staff of 50 persons, mostly engineers, who devote a small portion of their time to monitoring and enforcement of industrial noise control regulations. No growth is expected in the OSHA program through 1981.

Noise activities in the private sector are extremely limited. Sources indicate that at least 50 persons employed in auto companies are involved in research and development methods related to noise reduction in trucks and automobiles. No growth projections were available for this segment of the workforce.

III. PESTICIDES

The Michigan Department of Agriculture is the state lead agency for the pesticide applicator certification program. Within the Department, the Plant Industry Division (PID) is responsible for administering and implementing the state certification plan and conducting regulatory activities. The PID has a professional staff of 70. Professional specialities include entomology, plant pathology, horticulture, biology, agriculture, botany, or forestry. In total, an estimated eight person years are allocated to pesticide programs. Sources indicate that an increase of ten to fourteen staff members will be required over the next five years.

The Michigan State Cooperative Extension Service, which has responsibility for developing the applicator certification training programs, is staffed with a full-time coordinator and nine training specialists. An additional 25 persons provide supportive services to the specialists. No growth in personnel is expected during the next five years.

Other state agencies involved with pesticide control include the Michigan Department of Public Health and the Michigan Department of Natural Resources. A total of ten persons in these agencies are active in pesticide programs. No growth is foreseen through 1981.

Sources estimate that there are 2,040 commercial applicators and 25,000 farmers involved in pesticide use. Projections in the private sector include a 10 percent per annum growth in commercial applicators through 1981.

IV. POTABLE WATER

The Michigan Department of Public Health, Bureau of Environmental and Occupational Health, Division of Water Supply is the primary state agency responsible for the potable water program. The Division presently has a professional staff of eighteen which consists of 15 engineers, 1 chemist, and 2 administrators, As the Division proceeds to implement the Safe Drinking Water Act, staff requirements are expected to grow to a total of 113 persons, with the greatest growth in the sanitarian category.

Laboratory analysis is conducted by the State Public Health Laboratory. Approximately 16 person-years of effort is devoted to potable water laboratory analysis. Staffing of the laboratory is expected to double during the next five years as a consequence of the Safe Drinking Water Act.

There are an estimated 1,367 operators employed in distribution systems, filtration systems, disinfection systems, and other miscellaneous treatment systems. The disinfection systems employ a total of 419 operators; miscellaneous systems, 419; filtration systems, 298; and, distribution systems, 231. During the next five years, the most significant private sector increase will be in the demand for distribution systems operators. In excess of 1,000 communities may require certified distribution system operators. An increase of nine percent per annum is also projected for the growth in demand filtration system operators.

V. RADIATION

Primary responsibility for radiation protection is vested in the Michigan Department of Public Health, Bureau of Environmental and Occupational Health, Division of Radiological Health. The Division has a professional staff of eleven which includes 1 engineer, 7 physicists, 1 chemist, 1 technician, and 2 other. Over the next five years, the environmental monitoring staff of the Division will probably increase by approximately two persons.

Private sector data concerning numbers of individuals employed in radiation protection is not available at this time. There are approximately 226 facilities in Michigan using industrial X-ray devices in Michigan. Each of these facilities is likely to have a safety officer, often an industrial hygienist, responsible for the proper use of equipment. In addition, approximately 1,838 hospital and clinics use medical diagnostic machines. It is feasible that each of the facilities employ one person, frequently a health physicist, to care for the equipment. Limited workforce projections are available for the private sector. Five nuclear power plants are scheduled for operation during the next five years. This undoubtedly will cause an increase in the number of health physicists and other personnel employed in radiation protection.

VI. SOLID WASTE

Responsibility for solid waste management has been assigned to the Michigan Department of Natural Resources, Resource Recovery Division. The Division is staffed with a total of eleven professionals which includes 4 engineers, 5 sanitarians, and 2 geologists. Sources in the Division indicate that they anticipate adding fourteen professional members to the staff during the next five years. These staff members are required for increased surveillance, hazardous waste, and resource recovery activities. Further expansion may result from the implementation of a hazardous waste program as mandated through the Resource Conservation and Recovery Act.

Private sector estimates include about 13,000 persons who are employed in solid waste collection and disposal activities in the state. There are approximately 600 landfills in the state, only 350 of which are licensed sanitary landfills. Sources indicate that there are an estimated 1,205 persons employed at the landfills. A total of about 12,500 persons may be employed in collection systems, with 5,000 of the persons serving as drivers. In addition, Michigan has 70 operable transfer stations which are staffed by a total of 90 persons. Michigan does not have, as yet, any municipal resource recovery facilities. The collection system workforce is expected to increase by about 500 employees per year for the next five years. This growth is attributed to the closing of open dumps and the continual growth in the quantities of solid waste generated. Minimal growth is also anticipated for the workforce in the transfer systems.

VII. WASTEWATER

Operating under the Water Resources Commission, the Water Quality Division of the Michigan Department of Natural Resources, Bureau of Environmental Protection is responsible for the administration of Michigan's water pollution control program. The Division is presently staffed with 79 professional and technical personnel including 34 engineers, 14 biologists, 5 technicians, 7 water quality administrators, 5 water quality supervisors, 5 conservation planners, 5 water rsource planners, 3 wastewater treatment specialists, and 1 bacteriologist. While there is a demonstrated need for doubling the staffing of the Division, sources anticipate that over the next five years only about fifteen additional positions will be authorized.

The Environmental Services Laboratory provides approximately sixteen person-years of effort to water analysis. Over the next five years, the Laboratory expects to increase its staff by about thirty-five persons.

The municipal wastewater treatment facilities may employ up to 3,100 persons, and private industry employs approximately 1,178 operators certified for industrial and commercial wastewater treatment. Althougn municipal treatment facilities will be expanding, limited growth in the number of treatment operators is expected. Sources indicate that only 200 new certified operators will be needed. Minimal growth is projected for the industrial sector.

VIII. ENERGY

The Energy Administration of the Michigan Department of Commerce has been delegated responsibility for developing and coordinating state energy policy. The Administration has a professional staff of fourteen persons: 1 director, 2 deputy directors, 1 administrative assistant, 3 research and policy analysts, 1 fuel allocation officer, 1 education coordinator, 3 conservation coordinators, 1 energy information specialist, and 1 wood energy specialist. Sources anticipate a growth of approximately ten additional positions over the next five years.

The Michigan Energy and Resources Research Association is a consortium of representatives from state government, universities, and industry. The function of the Association is to obtain funding to conduct energy-related research and to utilize the available expertise in carrying out the projects. The staff consists of its part-time president and one full-time research person. No staff projections are available for the association.

Private sector workforce projections are limited. Sources indicate that the major utilities in Michigan have been active in the energy field. They are active in research in the areas of coal gasification, direct combustion systems, and the feasibility of solar and wind power usage. No estimates are available on the number of persons employed in these activities. Sources indicate significant growth in the private sector energy-related programs during the coming five years.

STATE OF MICHIGAN - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	1,136	1,186	1,236	1,286	1,336	1,386	4%
NOISE [1]	6	6	6	6	6	6	0
PESTICIDES	27,145	27,351	27,577	27,826	28,100	28,401	1%
POTABLE WATER [2]	1,170	1,210	1,276	1,336	1,399	1,439	4%
RADIATION [3]	12	12	12	12	13	13	N/A
SOLID WASTE [4]	13,806	13,851	14,355	14,860	15,366	15,873	3%
WASTEWATER	4,392	4,392	4,457	4,516	4,575	4,635	1%
ENERGY [5]	15	15	17	20	23	25	11%
TOTALS	47,682	48,023	48,935	49,862	50,818	51,778	2%

[1] This projection includes only the state agency personnel.

[2] The above does not include distribution system operators. Estimates indicate that approximately 231 persons are currently employed as distribution operators, and that the demand for such operators may increase.

[3] The above does not include information on the private sector.

[4] These estimates include both public and private sector estimates; however, if the hazardous waste program is developed as proposed, staff projections for the state agency will approximately double.

[5] These estimates reflect only public sector workforce projections.

EDUCATION

Career training in environmental pollution control disciplines is available at numerous educational institutions throughout Michigan. The University of Michigan, Michigan State University, and Western Michigan University offer both undergraduate and advanced degrees in a wide array of environmentally-related disciplines including engineering, agriculture, sciences, and public health. The University of Michigan environmental curriculum is representative of the quality training available through institutions of higher education in Michigan. For example, the University of Michigan offers B.S.E. and M.S.E. degrees in Civil Engineering with concentrations in Sanitary Engineering, Environmental Engineering, Water Resources Engineering, Water Resources Sciences, Municipal Engineering, and Public Health Administration. The University also offers M.S., M.P.H., Ph.D., and Dr.P.H. degrees in Environmental and Industrial Health. Seven concentrations are options under this program.

Ferris State College, a four-year institution, offers three environmental majors: environmental health, environmental health technician, and pesticide technology. Associate degrees in environmental training programs are also available through Monroe County Community College and Bay de Noc Community College. Monroe County Community College offers an A.A.S. degree in Environmental Technology. Bay de Noc Community College in Escanaba offers a Water Pollution Control and Purification Technology associate degree program.

LEGISLATION

The environmental/energy legislation for Michigan was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Act of 1970

Air Pollution Control Act

Pesticide Control Act

Safe Drinking Water Act

Radiation Control Act

Resource Recovery Act

Solid Waste Management Act

Soil Erosion and Sedimentation Control Act of 1972

Water Resources Commission Act

Waterworks and Sewerage Systems Law

Cleaning Agents and Water Conditioners Act

Liquid Industrial Waste Disposal Act

Watercraft Pollution Control Act of 1970

Shorelands Protection and Management Act of 1970

Michigan Energy Act

National Environmental Energy Workforce Assessment

Phase I

MINNESOTA

State Summary

I. AIR

The Air Quality Division of the Minnesota Pollution Control Agency (MPCA) administers the state air pollution control program. Operations of the Division are carried out though the heaquarters located in Roseville and five regional offices. The Division's professional and technical staff currently totals thirty-eight persons. The staff is composed of engineers, scientists, and technicians. The Division anticipates a minimum of 5% per annum growth during the next five years.

Other state agencies providing support to the Division include the Attorney General's Office and the Minnesota Department of Health, Division of Environmental Health, Section of Analytical Services. A total of four person-years of assistance are provided. No increase in support is expected over the next five years.

There are three municipal air pollution control programs. The programs employ a total of six professional and technical persons. Positions include engineers, chemists, and inspectors. Staffing in these programs will remain stable through 1981.

Sources in the field estimate that there are up to 400 technical and professional persons employed in air pollution control activities in the private sector. This translates into 130 person-years of effort. Workforce requirements for the private sector are expected to grow by 5% per annum during the next five years.

II. NOISE

Primary responsibility for noise control is vested in the Noise Pollution Control Section of the Minnesota Pollution Control Agency (MPCA), Air Quality Division. The current professional staffing level of the Noise Pollution Control Section is two persons: one mechanical engineer who is a specialist in noise and an assistant. The Section has proposed to add four new positions in Fiscal Year 1978. They are an airport noise control specialist, a highway noise control specialist, a community programs and special studies person, and a technical services person. Sources at MPCA also indicated that there is a need for at least one noise specialist in each of the five regional offices to respond to complaints.

In the private sector most noise control work is concerned with designing quieter mechanical devices such as lawnmowers, mixers, and air conditioners. Sources were not able to provide estimates of the number of persons engaged in noise abatement activities in the private sector. The workforce in the private sector is expected to increase only minimally over the next five years.

Educational opportunities in the noise area are limited in Minnesota. Engineering departments of various colleges and universities offer some courses in noise control and conduct occasional noise control research. It appears that no vocational/technical institutions offer any noise control instruction that leads to a degree or certification.

III. PESTICIDES

The Minnesota Department of Agriculture, Agronomy Services Division, is the state lead agency for the operator certification and pesticide control program. Twenty-one staff members, including the sixteen-member field inspection staff, devote all or part of their time to the pesticide program. No growth is expected in the staffing requirements of the program during the next five years.

The Department of Agriculture, Laboratory Services Division, the Department of Natural Resources Laboratory, and the Department of Health, Section of Analytical Services devotes approximately seven professional person-years to pesticide laboratory analysis. No increase in staffing requirements is expected in the pesticide area during the next five years.

Also providing support to the Agronomy Services Division are the ninety-one county agricultural inspectors. The amount of time that the county agricultural inspectors devote to the pesticide program is dependent upon the nature of each county's economy. No growth is expected in the percentage of effort commitment over the next five years.

Sources in the field indicate that there are 1,880 commercial applicators and 18,000 farmers involved in pesticide activities. A decline is expected in the number of commercial applicators over the next five years.

IV. POTABLE WATER

The Minnesota Department of Health, Division of Environmental Health, Sections of Public Water Supply and General Environmental Engineering have regulatory responsibility for the potable water program. A total of nineteen professional and technical staff members are directly involved in the water supply program. The Section expects an average annual growth in staffing requirements of approximately 12% over the next five years.

The Minnesota Department of Health, Division of Environmental Health, Section of Analytical Services, has a staff of eighteen people working in water analysis. During the next five years, a total of eight to ten additional persons will be added to the staff. Further, sources in the field indicate that there are fifty municipal and thirty-five private laboratories which also conduct analyses of water supplies. Approximately 200 persons are currently employed in these laboratories, and it is projected that the staffing of the laboratories will grow by five to ten percent annually during the next five years.

There are approximately 1,095 certified treatment plant operators and an additional four hundred operators who were certified under the "grandfather" provisions. Sources also concluded that there are fifteen hundred non-certified operators in the state. A 5% per annum growth in demand for water treatment plant operators is expected through 1981.

V. RADIATION

The Minnesota Department of Health, Bureau of Environmental Health, Radiation Control Section has primary responsibility for radiation protection. The Radiation Control Section has a professional staff of nine members: a director and eight inspectors. Sources at the Section expect the staff to increase by no more than two persons by 1982.

The Occupational Health Section of the Minnesota Department of Health, Bureau of Environmental Health is also involved in radiation protection. This section is responsible for enforcing radiation protection standards in industry. This Section has a staff of seven industrial hygiene engineers and three chemists. No additional staff will be added to the Section during the next five years.

Private sector data concerning numbers of individuals employed in radiation protection is not available at this time. There are seventy-three facilities using industrial X-ray devises in Minnesota. Each of these facilities is likely to have a safety officer, often an industrial hygienist, responsible for the proper use of the equipment. In addition, 1,038 hospitals and 361 clinics using medical diagnostic machines may have one person in each facility. The two nuclear power plants also employ safety staffs. Little growth in the private sector workforce is expected during the next five years.

VI. SOLID WASTE

Solid waste management regulation is the principal responsibility of the Minnesota Pollution Control Agency, the Division of Solid Waste. The current professional and technical staffing level for the Division of Solid Waste is twenty persons. Most staff professionals have background in engineering, geology, or science. The Division anticipates a 3% per annum growth in staffing through 1981, with growth primarily in the engineering and geology categories.

Laboratory support is provided by the Minnesota Department of Health, Division of Environmental Health, Section of Analytical Services. This Section devotes less than one person-year to the solid waste program.

Professional estimates concerning the private sector solid waste workforce indicate that a total of 2,831 persons are involved in municipal and private sector collection and disposal jobs. A total of 604 persons are currently employed at the 181 permitted solid waste disposal and processing facilities. In addition, 1,300 drivers and 1,350 jumpers are active in the collection field. During the next five years minimal growth is expected in either field.

Minnesota does not yet have any licensed resource recovery facilities in the state. Approximately 20 resource recovery/ energy conversion operations are in the design stage but will not be operational until at least 1982.

VII. WASTEWATER

The Minnesota Pollution Control Agency, Division of Water Quality is responsible for the administration of the state's wastewater pollution control program. The Division of Water Quality staff operates out of the headquarters in Roseville and five district offices. The Division has a professional and technical staff of 102 persons. A majority of the professionals have training as engineers, chemists, biologists, and planners. Eight of the positions are considered to be temporary. Minimal growth is expected during the coming five years. The eight temporary positions will be phased out, and only one new staff position will be added.

The Section of Analytical Services, Division of Environmental Health, Minnesota Department of Health provides laboratory support to the program. In this laboratory, eighteen persons work in water analysis. The Section may obtain an additional nine to ten professional staff members over the next five years.

There are 827 certified operators working in municipal, state, federal, private, and industrial wastewater treatment facilities, as well as 232 certified collection facility operators. Further, there may be up to 500 operators who are not certified, and another 300 persons working in such capacities as mechanic, laborer, chemist, laboratory technician, and clerk. Little growth is expected in the private sector wastewater pollution control workforce due to budgetary restrictions.

VIII. ENERGY

The Minnesota State Government has one principal energy agency, the Minnesota Energy Agency (MEA). The staff of the MEA is currently composed of forty-three professional and technical personnel. Major categories of employees include engineers, fuel allocation officers, research analysts, and planners. The MEA expects to experience a growth of approximately two positions per year over the next five years. Research scientists and engineers will be sought to fill these positions. Growth in this Agency is expected to continue as long as the federal government continues to pursue regulatory solutions to energy problems rather than market solutions.

Field research indicates that in the private sector most energy-related activities are conducted in the area of energy conservation. Most of the larger companies in the state have hired or are in the process of hiring an energy coordinator to perform such functions as supervising boiler operations, assessing long-term fuel supply, developing an energy conservation plan, and controlling pollution. Energy coordinators are likely to be engineers. There are also several engineering firms which specialize in performing energy audits for large corporations. There may be as many as six companies in the state whose activities are solely concerned with energy conservation, with a total of fifteen engineers employed full-time. Little growth is anticipated in the larger corporations; however, some growth may occur among consulting firms to assist private industry in solving energy problems.

STATE OF MINNESOTA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	178	188	198	208	218	228	5%
NOISE [1]	2	2	6	6	6	6	N/A
PESTICIDES [2]	19,880	19,880	19,880	19,880	19,880	19,880	N/A
POTABLE WATER [3]	3,233	3,398	3,564	3,730	3,897	4,064	5%
RADIATION [4]	10	10	10	10	10	10	0
SOLID WASTE	2,851	2.851	2,851	2,853	2,854	2,855	0
WASTEWATER	1,997	1,997	1,999	1,994	1,996	1,999	0
ENERGY [5]	43	43	45	47	49	51	4%
TOTALS	28,194	28,369	28,553	28,728	28,910	29,093	

[1] The above includes data on the public sector only.

[2] This estimate includes both private and public sector figures. Some decline is expected in the number of commercial operators, however no estimate of the percent decline was available.

[3] These figures are projections for both the public and private sectors; however workforce estimates were not available on the fifty municipal and thirty-five private laboratories.

[4] The above includes only state agency staff. No private sector projections are available.

[5] No private sector projection is included in the above estimate.

EDUCATION

A number of environmental education programs are available through Minnesota's educational institutions for persons interested in environmental pollution control careers. Bemidji State University offers A.S., B.S., and M.A. degrees in Environmental Studies. Emphases are available in laboratory, water, wastewater, soils, air, and solid waste. Winona State University also offers a B.S. degree in Biology with a major in Environmental Studies.

Short term courses are available through Mankato Area Vo-Tech Institute, Rochester Vo-Tech Institute, St. Cloud Area Vo-Tech Institute, and 916 Vo-Tech Institute in White Bear Lake. Programs offered through these Institutes include Civil Technology, Mankato; Chemical Laboratory Technician, Rochester; Water and Waste Treatment Technology, St. Cloud; and Environmental Technology Air and Water Analysis, White Bear Lake.

Austin Community College awards A.S. degrees in Environmental Technology. Programs provide students with training for employment in water, wastewater, and solid waste-related occupations. Other available two-year programs include Chemical Engineering Technology available through S.W. State University, Environmental Technology offered through Suburban Hennepin County Area Vo-Tech Institute, and Water Purification Technician provided at Vermillion Community College.

LEGISLATION

The environmental/energy legislation for Minnesota was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Rights Act

Environmental Quality Board Law

Pollution Control Agency Law

State Environmental Policy Law

Pesticide Control Law of 1976

Solid Wastes Recycling Law

Water Pollution Control Act

Water Supply and Waste Water Treatment Facilities Law

Energy Agency Law

Critical Areas Act of 1973

National Environmental Energy Workforce Assessment

Phase I

MISSISSIPPI

State Summary

I. AIR

The Mississippi Air and Water Pollution Control Commission is responsible for the state's air pollution control program. Approximately 54 person-years of effort in the Commission is expended toward air pollution control, divided nearly equally among engineers, scientists, technicians, and clerical and administrative employees. Future workforce needs are not expected to be dramatic; an approximate annual growth rate of 4% is projected.

According to sources, most industries either use out-of-state corporate engineering staffs for air pollution control or hire private consultants. It is estimated that there are 25-40 persons in the private sector servicing the field, 10 of whom are consultants. Additional laboratory and testing personnel will be required in the private sector. The number of those in air pollution control in industries is also expected to increase over the next five years, but at a lower rate. Based upon available information, by 1982 there will be from 15 to 20 consultants in the field, consisting of engineers, scientists and laboratory technicians, and there may be as many as 60 persons in industries servicing the field on a part-time basis.

Training voids for the Commission's air pollution personnel are being dealt with by a regional training committee that was established by Region IV EPA. Training needs still exist, however, especially with regard to ambient monitoring.

II. NOISE

Efforts to locate activities within the State of Mississippi in the area of environmental noise control have not been successful. A Federal-State Coordinator in the Governor's office had been identified as the contact person for environmental noise. However, this person has left the post in that office and, currently, no new contact person has been identified. State sources in other pollution control fields are unaware of any efforts to implement environmental noise legislation. The Assistant Attorney General for Environmental Affairs has indicated that subcommittees relating to noise have not been formed within the Mississippi General Assembly. Further, a national survey of municipal noise ordinances prepared by Dr. Clifford R. Bragdon, and published in Sound and Vibration, December, 1976, reports that only the City of Jackson has a noise ordinance, a nuisance regulation which does not include acoustical criteria.

III. PESTICIDES

The Division of Plant Industry of the Mississippi Department of Agriculture and Commerce is the certifying agency for all except aerial applicators, and dealers, and is responsible for the pesticide registration program. The Agricultural Aviation Board certifies aerial applicators and the State Chemical Laboratory performs chemical and microbiological analyses for enforcement purposes. Within these agencies, approximately 49 persons are engaged in pesticide-related activities, most on a part-time basis, and include chemists, biologists, and persons from many facets of the agricultural field.

The Cooperative Extension Service of Mississippi State University provides training to commercial applicators, and utilizes nine extension specialists, most on a part-time basis. Private applicators are trained by 82 county agents.

In addition to the above, U.S. EPA Region IV operates a Pesticide Product Analysis Section in Bay St. Louis. The Section employs eight persons.

One additional entomologist per year will be required in the Division of Plant Industry and the State Laboratory may require staffing increases. No increases are projected for the other state agencies although the EPA Laboratory expects to add five positions in the next five years.

State sources estimate that 93,547 private applicators, 2,839 commercial applicators and 1,500 dealers will require certification by October 21, 1977, with an estimate 5% per annum growth thereafter.

IV. POTABLE WATER

The Mississippi Safe Drinking Water Act was passed in 1976, and is designed to allow the state to assume primacy for the Federal Safe Drinking Water Act. The Division of Water Supply is responsible for the state's drinking water program and support is received from the Department's Bureau of Local Health Services and Bureau of Public Health Laboratories. There are currently 150 persons providing services on a full- or part-time basis, including 11 engineers, 126 local health sanitarians, 10 scientists and 3 clerical personnel. Workforce growth will not be dramatic, according to sources, chiefly because of state budget limitations. Seven to eight engineers may be added during the next five years, along with a lawyer, an enforcement officer, two chemists and three secretaries.

The state coordinates a voluntary certification program for operators of water treatment plants. There are currently 153 licenses issued to operators, in four classifications. With 1,300 water supplies in the state, officials estimate that there are 1,200 uncertified persons operating water treatment plants. Sources estimate that by 1982 there will be 500 certified operators, although the total number of operator[illegible] not expected to increase.

The Mississippi Water and Pollution Control Operators Association sponsors week-long courses twice yearly for water and wastewater plant officials. While a small market exists at the present for institutional training programs in the field, the demand is expected to become greater in the future.

V. RADIATION

The State Board of Health is in charge of administering Mississippi's statewide radiation protection program. The Board's Division of Radiological Health has chief responsibility for the program and coordinates four programs: Environmental and Emergency Response Plan Development, X-Ray, Radioactive Materials and Non-Ionizing Radiation. The Division employs one director, two secretaries, one chemist and six health physicists. Within five years it is anticipated that five additional positions will be gained, for four health physicists, and several technicians. Monitoring around nuclear facilities will be started during 1977, and officials hope that local health department sanitarians can be utilized for collecting samples.

Data indicate that there may be one or two health physicists and eight to ten technicians for radiation control in nuclear facilities in the state. Three or four consulting firms offer radiation control services, which employ health physicists and radiation physicists. Workforces in nuclear facilities will increase as reactors commence operating. The number of consulting firms is expected to increase to nine or ten by 1982.

In sum, career opportunities should be available for health physicists and health physics technicians in both the public and private sectors. Radiation physicists and chemists should also be in demand.

VI. SOLID WASTE

The Mississippi State Board of Health is responsible for the state's solid waste management program, and will implement the provisions of the Federal Resource Conservation and Recovery Act of 1976. The Board's Division of Solid Waste has responsibility for the program and is assisted by 125 county sanitarians of the Board's Bureau of Local Health Services. The Division consists of one director, four sanitarians and one engineer. Officials preliminarily forecast that at least four additional personnel will be required to implement the new Act: an attorney, a chemist, a sanitarian and a secretary.

Sources estimate that 67 landfill operators and 67 spotters are employed in the state's landfills. A total of 1,111 persons are also estimated to work in solid waste management. including approximately 977 in collection. There is one hazardous waste disposal site in the state, staffed with two persons. Within five years the numbers of operators and spotters are expected to increase to approximately 87 each, and the total number employed is expected to be approximately 1,456. The number of persons staffing hazardous waste disposal sites is expected to increase to 16. The future of resource recovery in the state hinges upon the future markets for recovered materials.

VII. WASTE WATER

The Mississippi Air and Water Pollution Control Commission is responsible for the state's water pollution control program. In the Commission, 78 persons work full- or part-time in water pollution control. However, 68 person-years are spent in wastewater, chiefly engineers scientists and technicians. Officials do not anticipate that significant growth will take place within five years, beyond several additional engineers unless currently-unforeseen changes in strategy occur from the federal level. Also strict state budget limitations are in effect. The state has assumed NPDES permitting authority.

The state operates a voluntary operator certification program. There are 244 certificates issued to wastewater treatment plant operators. The total number of operators is estimated by officals to be 1,300. Administrators project that the number of certified operators will double in the next five years due to the move toward certification on the part of operators and to the construction, expansion and upgrading of plants.

The Mississippi Water and Pollution Control Operators Association offers two short courses annually for operators. The Commission also offers one-day and three-day upgrade workshop study sessions for operators. If the attractiveness of operator jobs improves and salaries increase, greater demand will occur for institutional operator curricula, although officials doubt their practicality at this time.

VIII. ENERGY

The Mississippi Fuel and Energy Management Commission has responsibility for the state energy program. The office is mainly involved in petroleum allocation, and has no direct activity in the area of pollution control, except as environmental regulations impact energy production activities. Efforts will soon be focused in the area of energy conservation since this agency will be the recipient of a grant stemming from the Energy Policy and Conservation Act of 1976 (EPCA).

The Commission currently has a staff of two. As task forces and advisory committees will be utilized to a large degree for implementing EPCA, an increase in the Commission's staffing level is not anticipated by officials.

One provision of EPCA provides for mandatory thermal efficiency standards and insulation requirements for new and renovated buildings. This will require highly trained architects, scientists and engineers with skills in building design, product development and efficient heating and cooling techniques.

STATE OF MISSISSIPPI - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR [1]	94	104	113	127	136	145	9%
NOISE [2]	0	0	0	0	0	0	0
PESTICIDES [3]	140	141	143	144	146	147	1%
POTABLE WATER [4]	303	379	451	528	599	664	17%
RADIATION [5]	10	12	14	16	16	16	11%
SOLID WASTE [6]	1,244	1,317	1,386	1,455	1,524	1,593	5%
WASTEWATER [7]	312	368	425	482	539	595	14%
ENERGY [8]	2	2	2	2	2	2	0
TOTALS	2,105	2,323	2,534	2,754	2,962	3,162	9%

[1] Includes the state agency (1976=54; 1981=65) and estimates of the private sector.

[2] No noise control persons have been identified. Sources indicate that chances for development of a state noise control program within five years are limited.

[3] Includes the state agencies and coutny extension. Not included are an estimated 93,547 private applicators, 2,839 commercial applicators and 1,500 dealers. The growth rate for commercial applicators and dealers is projected at 5% annually.

[4] Includes the state agency (1976=150; 1981=164) and certified water treatment plant operators.

[5] Includes the state agency. The number of consulting firms offering services in the field is expected to increase within 5 years. Requirements will also increase in the nuclear industry.

[6] Includes state agency personnel (1976=133; 1981=137) and estimate of the workforce involved in solid waste collection and disposal.

[7] Includes the state agency (1976=68; 1981=70) and certified wastewater treatment plant operators.

ncludes the state energy agency.

EDUCATION

Mississippi has two educational institutions that offer students environmental curricula in preparation for employment in an environmental capacity. Those institutions are Mississippi Valley State University in Itta Bena and the University of Southern Mississippi in Hattiesburg.

Mississippi Valley State University offers a B.S. degree in Environmental Health. Students receive training in the natural and physical sciences in addition to their environmental, health, and administration concentrations.

The University of Southern Mississippi provides one functioning B.A. or B.S. program in Environmental Technology. Other majors including 1) Environmental Health-Industrial Hygiene-Technology Emphasis, 2) Environmental Health-Sanitation Technology Emphasis, and 3) Industrial Technology Curriculum are limited in staffing and enrollment.

LEGISLATION

The environmental/energy legislation for Mississippi was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air and Water Pollution Control Law
Pest Control Law
Pesticide Application Act of 1975
Safe Drinking Water Act of 1976
Radiation Protection Act of 1976
Solid Waste Disposal Act of 1974

National Environmental Energy Workforce Assessment

Phase I

MISSOURI

State Summary

I. AIR

The Missouri state air pollution control program is administered by the Missouri Department of Natural Resources, Division of Environmental Quality, Air Quality Program. A total of 17 professional and technical personnel staff the Program. Of the 17 staff members, five and one-half person-years of effort are contributed by the regional offices. Unless the Clean Air Amendments are adopted, no more than four percent annum growth is expected for the state air program. If the Amendments are passed, ten more engineers would need to be hired.

The five local air pollution control agencies have a total of 60 professional and technical persons staffing the agencies. Sources suggest that little, if any, growth will take place in the staffing requirements of these agencies during the next five years.

Field research suggests that there are no more than 500 persons working in air pollution control in the private sector. Approximately 50 of these persons are consulting engineers. The majority of the non-consulting workforce is employed by the electric power, steel, lead smelting, and chemical industries. Sources indicate that the private sector may increase at an average per annum rate of between 3 and 5 percent over the next five years. Demand is expected to increase for both professionally and technically trained personnel.

II. NOISE

The Missouri Department of Natural Resources, the Missouri Department of Highways, and the Missouri Department of Transportation have limited noise control responsibilities.

The Department of Natural Resources employs one engineer who is assigned the responsibility of maintaining information on the current status of noise programs. The Department of Transportation is responsible for preparing Environmental Impact Statements for airport-related construction. This work is generally subcontracted to consultants. The Department of Highways performs noise studies prior to construction of new highways. The Department has one designated noise specialist, however, over 300 persons, mostly engineers, have some work in noise investigation and assessment.

Sources suggested that growth in the noise area will be dependent upon developments in both federal and state legislation. The Departments of Transporation and Highways expect minimal growth during the next five years. If the Department of Natural Resources were given authority for environmental noise control, additional persons would be hired.

Research indicates that there may be as many as 200 persons in the private sector and local government with part-time noise-related activities. Growth projections are not currently available on private sector activities.

III. PESTICIDES

The Missouri Department of Agriculture is the state lead agency for the operator certification and pesticide control program. The Department is staffed with a total of 25 professional and technical personnel who devote all or part of their time to pesticide programs. Over the next five years, the pesticide program anticipates increasing its staff by four positions, two area supervisors and two pesticide inspectors.

The Department of Social Services and the Cooperative Extension Service have a total of eighty professionals who are actively employed in pesticide-related activities. During the next five years, the Department of Social Services expects to increase its staff by a total of 11 persons, primarily chemists and sanitarians. No growth is projected in the Cooperative Extension Service.

Sources at the Department of Agriculture estimate that there are 12,000 commercial applicators, over 2,000 pesticide dealers, and 100,000 farmers in the state who are involved in pesticide application. No growth is expected in the private sector during the coming five years; in fact, experts estimate that the number of commercial applicators may decline as a consequence of the certification requirements. Growth beyond the current workforce levels ultimately will be dependent on whether there is a demand for commercial applicators to perform services previously handled through private applicators.

IV. POTABLE WATER

The Missouri Department of Natural Resources, Division of Environmental Quality, Water Supply Program has regulatory responsibility for the state's water supply program. The division headquarters is staffed by 12 professional and technical staff members, and the six regional offices contribute approximately nine person-years of support to the water supply program. No major increase in staff allocation to the potable water program is projected.

The Missouri Department of Social Services, Division of Health, Bureau of Laboratory Services provides analytical support to the Water Supply Program: five microbiologists allocate a portion of their time to potable water sample testing.

Experts in the state indicated that approximately 1,800 persons are employed by water supply treatment facilities in operational, maintenance, laborer, administrative, and supervisory capacities. Of this number, 552 persons are employed as certified water treatment operators. According to available information, staffing at the water supply treatment plants will increase by between 280 and 600 persons over the next five years, with the greatest increase in the 'C' and 'D' level plants.

The Safe Drinking Water Act is likely to increase the number of jobs for biologists, chemists, and laboratory technicians to conduct expanded sampling and analysis activities. The laboratory positions may more than double by 1982. It appears that these will not be state employees. If Region VII, EPA must open a field office, employees could number 49 by 1980.

V. RADIATION

Primary responsibility for radiation protection is vested in the Missouri Department of Social Services, Division of Health, Bureau of Radiological Health. The Bureau has a professional staff of three persons: 1 radiological health physicist, 1 biologist, and 1 mathematician. During the next five years, a staff increase of between 10 and 14 persons is desired. This anticipated growth is a result of the expanding workload and need for environmental monitoring near the proposed nuclear power site.

Private sector data concerning the number of individuals employed in radiation protection are not available. However, sources indicate that each of the 50 facilities using industrial X-ray devices is likely to have a safety officer, often an industrial hygienist, who is responsible for the proper use of equipment. It is further speculated that the 1,430 hospitals and clinics using medical diagnostic equipment may also have one person, frequently a health physicist, who is responsible for care of the equipment. No growth projections are available for this segment of the private sector.

Legislation is pending which would transfer the radiation program to the Department of Natural Resources. This action would expand the program to include monitoring radioactive waste disposal and transport of radioactive materials to and from nuclear facilities. If passed, this bill would have a significant impact upon program staffing.

VI. SOLID WASTE

The Missouri Department of Natural Resources, Division of Environmental Quality, Solid Waste Management Program administers the regulatory program for solid waste management in Missouri. The central headquarters and the six regional offices are staffed with a total of 10 persons: 4 engineers, 1 sanitarian, 1 scientist, and 4 others. Officials of the program anticipate a growth of from ten to twenty-five persons over the next three years, with the greatest staffing increment in the hazardous waste and resource recovery programs.

Estimates for the private sector solid waste workforce include 276 persons working in sanitary landfills, 12 persons in transfer stations, 4 persons employed at the two hazardous materials sites, and approximately 2,000 employees in collection systems. No specific workforce projections were obtained for the disposal workforce; however, sources in the field anticipate that the workforce in disposal may increase over the next five years as unlicensed dumps are closed and replaced with sanitary landfills. The workforce in the collection field is also expected to increase gradually as more municipalities implement mandatory collection systems and as population and the volume of solid waste generated grows.

At present there are no municipal resource recovery facilities; however, until recently there was an operable energy recovery demonstration project supported by EPA. Several agencies in the St. Louis area are investigating the feasibility of assuming responsibility for the site.

VII. WASTEWATER

The Missouri Department of Natural Resources, Division of Environmental Quality, Water Quality Program has regulatory responsibility for the wastewater pollution control program. The central headquarters and the six regional offices devote approximately 66 person-years of support to wastewater activities. This number includes 8 engineers, 10 scientists, and 48 others. An average annual growth of 5% is anticipated for the state program through 1981, with 10 of the positions allotted to the regional offices and 9 professionals added to the central headquarters staff. This growth will be necessary to deal effectively with "208" area wide planning and the growing workload associated with NPDES monitoring.

The Laboratory Services Division provides seven person-years of support to the Program. No growth is expected during the next five years. There are approximately 150 laboratories engaged in wastewater pollution control activities. There may be a total of up to 300 chemists and laboratory technicians employed in these laboratories.

Sources in the field indicate that there may be 2,000 operators and 1,000 additional persons involved in administration, maintenance, and labor in the municipal treatment facilities. Substantial growth in the number of operators is anticipated through 1980, with an average annual growth of 13%. While no specific figures are available, a concomitant growth is expected in the number of supportive staff members.

VIII. ENERGY

The Missouri State Government has one principal energy agency, the Missouri Energy Agency. The staff of the Agency is composed of six professionals, all of whom are degreed and have a variety of backgrounds including education, geology, political science, and sociology. Sources with the Agency anticipate an expansion in the staff will be necessary during the next five years. The Agency hopes to obtain an energy engineer and two other professionals in the coming years and about two professionals per year thereafter to 1982. These staffing increases will be dependent on the level of federal funding.

Data on the size of the private sector energy-related workforce are not currently available. Field research indicates that in the private sector most energy-related activities are conducted in the area of energy conservation. Numerous private industries are adding energy coordinators to their staffs. The coordinators are frequently responsible for supervising boiler operations, assessing long-term fuel supply, developing an energy conservation plan, and controlling pollution. Field research suggests that additional jobs may be generated in industry to coordinate energy conservation programs and to keep top management informed of energy-related legislation and regulations. Growth may also occur among consulting engineers to assist private industry in solving energy related problems.

STATE OF MISSOURI - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	580	598	613	629	645	662	3%
NOISE	586	586	586	586	586	586	0
PESTICIDES[1]	105	105	109	113	117	120	3%
POTABLE WATER	1,826	1,889	1,952	2,015	2,078	2,142	3%
RADIATION[2]	3	5	7	9	11	13	n/a
SOLID WASTE	2,303	2,309	2,315	2,321	2,327	2,333	0
WASTEWATER	3,373	3,950	4,171	4,386	4,601	4,604	7%
ENERGY[3]	6	9	11	13	15	17	n/a
TOTALS	8,782	9,451	9,764	10,072	10,380	10,477	4%

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[1] The above estimate does not include the 2,000 pesticide dealers, 12,000 owners, operators, and applicators, and the 100,000 farmers.

[2] This estimate includes projections for the state program; however, no information is included on the private sector.

[3] No private sector workforce projections are currently available.

EDUCATION

The higher education institutions in the State of Missouri offer a limited number of career options for students interested in pollution control and abatement occupations. Washington University, Central Missouri State University, Meramec Community College, University of Missouri, Crowder College, and the Water and Wastewater Technical School are among the educational institutions with environmental education program options.

An engineering curriculum with environmental emphasis is available through the University of Missouri at Rolla. Bachelor, Master, and Doctoral programs are offered in civil engineering through Washington University. Various environmental engineering courses are included within these curricula.

Two year training programs are offered at Central Missouri State University, Meramec Community College, Crowder College, and the Waste and Wastewater Technical School. A two-year Environmental Technology program is offered through Meramec Community College. Career training is available in water and wastewater treatment plant operation, sanitarian aide, public health engineering aide, stream sanitarian technician, and technical sales and service. Central Missouri State University offers an A.S. degree in Water and Wastewater Technology. Crowder College and the Water and Wastewater Technical School also award associate degrees in water and wastewater treatment plant operation.

LEGISLATION

The environmental/energy legislation for Missouri was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air Conservation Law
Pesticide Act of 1974
Economic Poisons Act
Radiation Control Law
Junkyards Law
Solid Waste Management Law
County Option Dumping Law
Clean Water Law
Waste Disposal Wells Law
Watercraft Sewage Disposal Law

National Environmental Energy Workforce Assessment

Phase I

MONTANA

State Summary

I. AIR

Air quality is considered to be quite good, overall, in Montana. The U.S. Environmental Protection Agency (EPA) has identified Kalispell, Missoula, Helena, Anaconda-Butte, Billings and the Southeastern Coal Resource Area as Air Quality Maintenance Areas (AQMA) and the state has been divided into five Air Quality Control Regions (AQCR).

The major air quality problems in the State of Montana are the result of violations of the copper mining and lead smelting industries, violations by oil refineries, and the wood products industry. Substantial contributors to air quality degradation are fugitive emissions from unpaved roads.

The primary responsibility for air pollution control and abatement in Montana has been allocated to the Air Quality Bureau of the Montana State Department of Health and Environmental Sciences. The Bureau maintains a staff of 29. Approximately 186 personnel are distributed across the local agencies and private industry.

The Air Quality Bureau should experience personnel increases specifically in the engineering category. It has been estimated, however, that industry may double its air pollution control and abatement personnel by 1985.

Professionals within the air pollution control and abatement field should encounter availability of jobs over the next five years. Occupations in this environmental area will result from the development of energy resources.

II. NOISE

Montana does not have an extensive noise pollution control and abatement program at the state or, as yet, at local levels. The Montana Department of Health and Environmental Sciences, Occupational Health and Radiation Bureau is the agency under which the state noise pollution control program is conducted, and the primary responsibilities may be described as predominantly within the realm of research and technical program assistance.

Although there have been substantially no changes in the number of regulations across the state within the last year, gradual changes in attitudes of residents living and working near energy impacted areas should stimulate increased awareness of noise problems. As the citizens develop awareness of the problems, preventive measures will be instituted. These preventive measures will involve planning and a skilled workforce will be required to initiate and conduct noise programs. It is felt that the overall workforce picture, including staffing requirements and variations in job titles, will be much more extensive after 1985. Competition will be keen in the state for the relatively small number of highly skilled technological positions which should be available to 1985.

The greatest number of career opportunities will be manifested at the local level and to a great degree in the area of enforcement. As energy resource development continues in Montana, specialized scientific personnel will be in demand by the private sector.

III. PESTICIDES

The primary responsibility for pesticides programs and activities has been allocated to the Department of Agriculture. The Department of Health and Environmental Sciences periodically conducts studies relative to the reporting of pesticides illnesses and safety procedures, and programs of unusual interest are conducted by the Department of Livestock, in conjunction with the Department of Agriculture.

Within the Department, the pesticide responsibilities are delegated to the Pesticide Division. There are 11 pesticides personnel attached to the Department of Agriculture, approximately 1,651 commercial applicators, and an estimated 12,000 private applicators.

No staff changes are anticipated for the Department of Agriculture over the next five years. The commercial applicators should experience an approximate two percent per annum increase, while the private applicators, consisting mostly of farmers, will experience a one percent per annum increase.

The Department of Agriculture has indicated a willingness to develop cooperative agreements with the state's Indian reservations and technical assistance has been offered.

Career opportunities will include applicator occupations which will require specialized skills and knowledges that may be considered unique to the western areas.

IV. POTABLE WATER

Montana has an abundant supply of water. In an effort to protect the water resources, there are a number of federal and state agencies which conduct water related programs. The Montana Department of Health and Environmental Sciences, Environmental Health Division, however, is the lead agency. The Department has designated the Water Quality Bureau as administor of the potable water program. The program includes 11 personnel. In addition, there are approximately 623 water treatment and distribution plant operators and 300 administrative and supervisory personnel.

Projected workforce requirements to 1982 indicate an approximate three percent per annum increase for Water Quality Bureau personnel. Water treatment and distribution plant personnel should experience an approximate nine percent per annum increase.

Montana contains portions of three major drainage systems, 25 major dams and innumerable lakes. Water, however, in most of the west is a premium commodity. Therefore, research and innovative planning will be required in order to meet potential water problems. Efficient utilization of the workforce is also a necessity in a state endeavoring to control expansion of government. The level to which workforce opportunities will develop will depend largely on the commitment of the state to meet federal guidelines, the level of federal support necessary to ensure guidelines are met, e.g., the Safe Drinking Water Act, 208 Planning.

V. RADIATION

The Department of Health and Environmental Sciences, Occupational Health and Radiation Bureau, has been allocated the primary responsibility for radiation control in the state. At present, Montana does not have "agreement" status with the Nuclear Regulatory Commission (NRC) regarding licensing of nuclear materials. Dental radiological activities also do not come under the purview of the state. The radiation program, therefore, is not extensive in Montana.

There are three full-time personnel assigned to radiation control activities within the state. Approximately 730 other personnel have been identified who are occupationally exposed to radiation and radioactive materials.

The state personnel should almost double by the year 1982. The persons associated with radiation and radioactive materials across the state will experience an increase in staffing levels, but firm figures are not available at this time.

There is little evidence to support the emergence of new career opportunities in radiation control in Montana. Job opportunities will be available over the next five to ten years in this field, however, many of these occupations will require specialized training. As energy resource development activities continue across the state, radiation related activities should accelerate.

VI. SOLID WASTE

In Montana the solid waste management responsibility has been allocated to the Department of Health and Environmental Sciences, the Environmental Sciences Division, the Solid Waste Management Bureau. The protection of public health by ensuring proper solid waste disposal is the major goal of the Bureau. In order to enforce the solid waste laws and regulations, Bureau personnel work in conjunction with county and local health officers and sanitarians. The Solid Waste Management Bureau presently has a total staff of nine. There are approximately 190 personnel in the public and private sectors in addition to the state staff.

The Department of Health and Environmental Sciences personnel are expected to experience an approximate four percent per annum increase in workforce. The statewide staffing levels should change very minimally over the next five years.

Although the state Bureau staff is estimated to experience an average four percent per annum growth to 1982, state program responsibilities should increase in greater proportion than personnel. The philosophy and underlying commitments of the state's solid waste management program are seen in the strides which have been made recently. The Junk Vehicle component of the program is an innovative example as well as a trend setter throughout the region. In crowded eastern states, junked vehicles are not so obvious and do not present the same visual insults to broad expanses of untarnished landscape.

VII. WASTE WATER

Montana waste water problems are relatively few due to the lack of industry. Agricultural run-off is a major problem, and sludge is increasing as an area of concern. Smelters, refineries, and existing and proposed power plants contribute to the waste water problems of the state. A major effort is currently underway by the lead agency, the Montana Department of Health and Environmental Sciences, Water Quality Bureau, to regulate and educate logging and construction companies regarding the effects of top soil clearing.

Relatively slight increases in staff are anticipated to occur within the waste water area of the Bureau of Water Quality over the next five years. State laboratory personnel who allocate time to waste water duties should experience minimal growth. Estimates regarding the operator workforce anticipate increases of 5% to 12% per annum.

Construction and mining activities in Montana carry the potential for non-point source pollution problems, possibly the greatest water pollution problem in the state. State laws were changed in order to meet federal requirements for administration of the National Waste Discharge Permit Program. Due, in most part, to increased state and federal funds, improvements of domestic sewage and industrial waste has occurred. Non-degradation policies will be applied to new resource development.

VIII. ENERGY

The development of Montana's vast energy resources remains the overwhelmingly serious threat to the state's environmental quality. Currently, in Montana there is no state energy office and no comprehensive state energy policy. There are several agencies which, to varying degrees, impact the environmental problems associated with energy within the state.

In 1973, the Governor outlined energy development challenges to the state and created the Montana Energy Advisory Council. This council assembles, analyzes, interprets and disseminates energy development related findings and is as close to the concept of a state energy office as may be found in Montana.

Career opportunities are anticipated to be available over the next three to five years. Degreed level professionals, i.e., highly trained engineers and scientists will be major components of the future workforce involved in energy related pollution control and abatement endeavors.

The workforce at the state level, however, will present few career opportunities. The major areas of potential employment will be within the private sector. Most likely the Montana labor pool will be unable to fill workforce requirements if energy resource development and conversion activities accelerate.

STATE OF MONTANA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	213	219	226	233	240	240	3%
NOISE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES[2]	1,640	1,635	1,689	1,714	1,740	1,766	2%
POTABLE WATER[3]	934	997	1,064	1,139	1,223	1,316	6%
RADIATION	735	749	764	779	795	811	2%
SOLID WASTE	200	204	208	212	216	221	2%
WASTEWATER[4]	628	658	691	726	757	795	5%
ENERGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTALS	4,350	4,462	4,642	4,803	4,971	5,149	3%

[1] Does not include total private industry growth which may amount to 20% per annum

[2] Does not include 12,000 private applicators.

[3] Major increases will be in operator category.

[4] Depicts major growth in operator category.

EDUCATION

Montana supports three public community colleges and three private colleges. In addition, the Montana University System includes six entities located across the state. A variety of environmental courses are offered.

The University of Montana was established in 1893 in Missoula. Special facilities for the environmental studies students include: an environmental laboratory; an environmental library; and various bodies of water as well as forested areas in varying degrees of environmental degradation. The University of Montana offers an M.S. degree program in Environmental Studies. B.S. and M.S. programs are available in Resource Conservation.

The Montana College of Mineral Science and Technology or the School of Mines was established in 1895 at Butte, an area of extensive mineral operations. Students work in the mines, mills or smelters. The Montana Bureau of Mines & Geology was established as a department of the College in 1919. Other components of the school include: mineral museum, minerals research center, seismograph station, and computer center. An Environmental Engineering program may lead to a B.S. degree. A new addition to the programs offered at Northern Montana College is the water-wastewater technology curriculum. This is the only post-secondary institution in the Montana University System which has combined and consolidated the vocational technical and academic areas of the water-wastewater training.

LEGISLATION

The environmental/energy legislation for Montana was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Policy Act
Clean Air Act of Montana
Montana Pesticides Act
Laws Regarding Public Water Supply
Radiation Control Law
Control of Refuse Disposal Areas Act
Junk Vehicle Disposal Law
Refuse Disposal Districts Law
Laws Regarding Water Pollution
Water Use Act
Open Space Land Act

National Environmental Energy Workforce Assessment

Phase I

NEBRASKA

State Summary

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I. AIR

Nebraska air pollution problems are those associated with motor vehicle emissions and suspended particulates.

The Department of Environmental Control's Air Pollution Control Division is the state lead agency dealing with air pollution matters, although local air quality programs are conducted in Omaha and Lincoln. Monitoring air pollutants and providing technical assistance are the major program functions at both the state and local level.

A total of 12 persons comprises the staff of the Air Pollution Control Division with its two sections: Engineering, and Surveillance and Enforcement. An equivalent of 14 full-time persons staff the local air pollution control programs. Engineers with civil, chemical or air pollution backgrounds and scientists with chemistry or biology training are the major professional categories.

Nebraska's air agencies have experienced substantial growth in recent years, and very little staff expansion is seen for the next five years at either the state or local level. Highly-trained personnel will be required for any openings which may exist, particularly in light of a 15% to 20% annual turnover rate in these positions. Future amendments to the Clean Air Act and increased efforts to prevent deterioration of air quality may result in some workforce growth not foreseen at this time.

II. NOISE

Noise is not currently a high-priority environmental area in Nebraska. The only attempts to regulate noise are found in a statute relating to heavy-duty motor vehicles and six municipal noise ordinances in various parts of the state.

The Air Pollution Control Division within the Department of Environmental Control is the state lead agency for noise matters, but no one on its staff is designated as full-time in the noise field. Local noise ordinances are enforced by law enforcement personnel in the respective areas. No information is available on the number of persons involved in this activity, but it is probably minimal.

Little workforce growth and few career opportunities are anticipated in Nebraska's noise program over the next five years. The use of sophisticated noise monitoring equipment and greater concern with consumer product noise and motor vehicle noise are factors which could affect workforce in this area in future years.

III. PESTICIDES

The use of pesticides in an agricultural state such as Nebraska has always been important. The workforce implications of pesticide use have changed dramatically in recent years with the passage of the Federal Environmental Pesticide Control Act.

The Department of Agriculture is the state lead agency for pesticide activities with specific responsibility being in the Feed and Agricultural Chemical Division. The University of Nebraska Cooperative Extension has provided assistance in applicator training sessions.

A staff of four persons handles pesticide matters for the Feed and Agricultural Chemical Division. Eight additional Department inspectors work on pesticide matters to a limited extent. Three other people are involved in pesticide analysis and education coordinating activities. It is estimated that as many as 40,000 farmers and 3,000 commercial applicators may be certified to apply restricted-use pesticides.

Staff growth in the pesticides public sector will be limited over the next five years as it is felt that the current staff is adequate to fulfill responsibilities. Some additional growth in the number of applicators may develop although the program is so new that projections are difficult to make. Persons with agricultural background will be most in demand, with the need for greater yields and less pesticide run-off being areas of growing concern.

IV. POTABLE WATER

Potable water supplies in Nebraska are the responsibility of the Division of Environmental Engineering within the Department of Health. In 1976 a state Safe Drinking Water Act became law and is administered by the Division; it is through this law that the state is attempting to gain primacy in drinking water matters. The Department of Water Resources has an ancillary role in water supply matters.

The Division of Environmental Engineering has a staff of ten persons in its Lincoln office. Civil engineers and engineer aides are the most common professional areas. The Department of Water Resources has a staff of 30 employees, mostly hydrographers and water resource technicians, but only a small portion of their time is devoted to potable water matters.

Growth over the next five years is expected to be considerable in the Division and a staff of approximately 27 persons is expected. Safe Drinking Water Act mandates account for most of the growth, and career potential appears to be best for engineers and scientists.

A mandatory water supply operator certification program is being phased in, in Nebraska. There are approximately 250 operators certified under a voluntary program, but as many as 1,500 persons may eventually require certification.

V. RADIATION

Radiation protection matters in Nebraska are the responsibility of the Division of Radiological Health within the Department of Health. The Radiation Control Act for the state was substantially amended in 1975 and deals with both ionizing and non-ionizing radiation.

The Division has a staff of five people, three of whom are classified as radiological health specialists. The nine-member Radiation Advisory Council is not a part of the Division staff, but does provide technical support services.

The Division of Radiological Health has grown from a staff of one in 1970 and expectations are that there will be eight employees by 1981. All growth is expected to be in the category of radiological health specialist. Retention of top level personnel has been a problem in the past because of the salary structure.

As nuclear power becomes more prominent in Nebraska and more such facilities are put into operation, workforce needs in this area will increase. Highly trained persons in radiation and physics may be needed in the public and private sectors in the 1980s.

VI. SOLID WASTE

Solid waste management is becoming an area of greater concern in Nebraska as in many other states. The Solid Waste Pollution Control Division within the Department of Environmental Control is the state lead agency for regulating disposal and land quality problems.

The Solid Waste Pollution Control Division has a staff of seven persons in its two sections - State Planning, and Surveillance and Enforcement. Engineers with chemical or sanitary training, together with life scientists, are the most common professions on the staff.

Significant workforce growth is expected in the Division, largely as a result of the Resource Conservation and Recovery Act. Environmental specialists, life scientists and engineers would all be added in proposals to increase the staff to 16 persons. Consideration is also being given to enactment of a state litter control law which would impose additional workforce needs on the Solid Waste Pollution Control Division. Disposal site personnel training and the potential need for planners under the new federal legislation are other areas of concern.

VII. WASTEWATER

Water is a crucial resource for the State of Nebraska, and its quality must be protected for human, industrial and agricultural uses. The Department of Environmental Control's (DEC) Water Pollution Control Division has primary responsibility for water pollution control matters in the state. The Agricultural Pollution Control Division is another branch of DEC which protects water quality through regulation of confined livestock feeding operations. The Natural Resources Commission is also concerned with water quality and has a major state role in Section 208 planning under PL 92-500.

The two DEC Divisions have a combined staff of 50 persons; life scientists reporesent the most common professional category with a large complement of sanitary and agricultural engineers. The Natural Resources Commission has a staff of 63 although only a portion of these are involved in water pollution matters. Civil engineers and engineer technicians are the most common professions in this agency.

Because of increasing legislative mandates, significant workforce growth is expected in Nebraska's water pollution control agencies over the next five years. The Water Pollution Control Division expects to increase the number of engineers and life scientists on staff.

Section 208 planning and discharge limitation requirements are the most commonly cited reasons for increasing personnel levels.

VIII. ENERGY

Nebraska has few energy resources; it has limited oil and gas production and is just beginning to develop a number of nuclear power plants. For this reason, most state energy activity is directed toward allocation and conservation measures.

The State Energy Office within the Department of Revenue, is the primary energy agency and is staffed by seven persons. Three members of the staff are engineers and act as energy coordinators. The Oil and Gas Conservation Commission was established to curb wasteful oil and gas production practices; it has a staff of four persons, including three Commission members.

Very little growth is expected in Nebraska's energy agencies over the next five years. The Energy Office has declined from a staff of 11 in 1974 and a return to this level is not likely unless stringent allocation and management guidelines are re-imposed. Some workforce growth for public utilities can be anticipated as planned nuclear power facilities become operational.

STATE OF NEBRASKA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	12	12	12	12	12	12	0%
NOISE[2]	--	--	--	--	--	--	--
PESTICIDES[3]	6	7	9	9	9	9	9%
POTABLE WATER[4]	10	11	17	20	24	27	23%
RADIATION[5]	5	6	6	7	7	8	10%
SOLID WASTE[6]	7	9	14	16	17	17	21%
WASTEWATER[7]	39	43	51	53	54	54	7%
ENERGY[8]	7	7	7	7	7	7	0%
TOTALS	86	95	116	124	130	134	9.6%

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[1] Does not include 14 local air program positions.

[2] Does not include local law enforcement personnel who devote some time to noise matters.

[3] Does not include training personnel nor approximately 3,000 commercial applicators and 40,000 farmers who may be certified.

[4] Does not include an estimated 1,500 water supply personnel.

[5] Does not include health safety officers nor private sector personnel.

[6] Does not include an estimated 100 position-equivalents employed in local disposal operations.

[7] Does not include 11 positions in the Agricultural Pollution Control Division nor that portion of the Natural Resources Commission staff active in water pollution matters. Also not included are an estimated 500 wastewater plant operators.

[8] Includes only State Energy Office position. Some growth may occur but cannot be accurately predicted at this time.

EDUCATION

Nebraska higher education institutions have not yet developed environmentally-related education programs in wide varieties or large numbers. This lack of development can perhaps be attributed to the fact that Nebraska's environmental problems are not as critical as those of other states.

A number of two-year institutions are beginning to move into the environmental field. The following are examples of some programs: Central Technical Community College in Environmental Technology and Ag-Chemical Technology; Northeast Technical Community College and Southeast Community College in Environmental Technology and Agricultural Chemicals.

At the four-year level Chadron State College has cooperated in operator training courses and is attempting to establish a Center for Environmental, Historical, and Multi-Cultural Background Studies. The University of Nebraska has programs in Environmental Health and Sanitary Engineering.

LEGISLATION

The environmental/energy legislation for Nebraska was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Act of 1971
Control of Smoke Emissions and Noise Law
Pesticide Applicator Law
Safe Drinking Water Act
Radiation Control Act
Groundwater Well Irrigation Law